ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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What in the World!

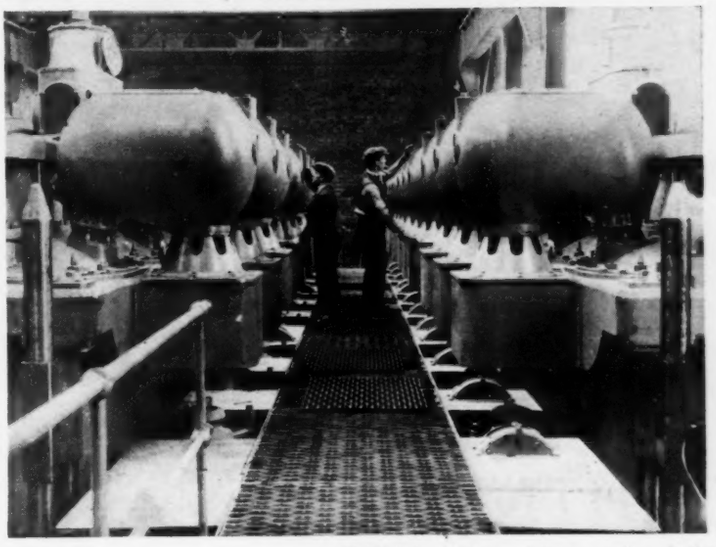
Your "Electrical World," and ours, journeys to far corners of the earth. This week we received a letter from the electrical adviser to a far-eastern potentate who conceded that he had no sooner opened his copy (April 29) to a news item about a unit type of air conditioner than off came an inquiry to ascertain if India's climate could be so tempered for a Maharaja. Inquiries from five countries greeted the announcement of an improved gaseous discharge lamp. South Africa, China, Canada and Mexico joined American readers in common interest. Economics and governmental co-operation may not be international, but, verily, engineering and its progress is.

●

Engineers' Week at the Century of Progress seems to have been a great success. Numerous national professional engineering organizations held their meetings then and the inexhaustible and constantly augmented store of physical triumphs that are made, depression or no depression, yielded encouraging news of advances in theory, research, practice and application. There stands an opportunity for yet closer co-ordination and larger understanding among the men of the various branches of the art that its advance may be the more rational.

●

If there be doubters who stoically resist the softening influences of air-conditioned comfort in these days of tropic heat and humidity intensity, take them off for a comparison of how the customers flock to air-conditioned areas. Then they may measure the commercial opportunity not by how they personally feel but by how the citizen with the dollar to be spent goes where it may be parted with under least discomfort. Just as the non-air-conditioned theater has had to yield to the one which also offers comfort, so must many other caterers to the massed public provide greater comfort on trains, in stores, in restaurants and in other places, if they are to as much as hold their own in the competition of the future.



Metal-clad switchgear, Battersea station, London

JULY 8, 1933

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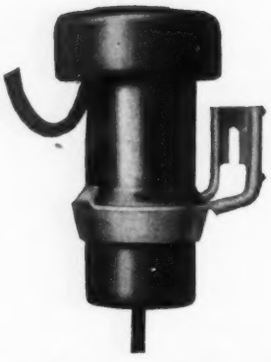

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401-46

GENERAL ELECTRIC

ELECTRICAL WORLD

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for the Week Ending

July 8, 1933

Washington Busy on Recovery

First Code Before President
Slow Progress on Public Works Program.

PRACTICAL moves toward business recovery in Washington are being made. The first code has been accepted by General Johnson and is now before the President for approval. This is a code for the cotton textile industry. It sets a minimum wage. It provides that productive machinery is not to be operated more than two shifts of 40 hours each week. It requires that information on all phases of the industry shall be made available and introduces eight provisions for co-operation of the code committee of the industry with the N.I.R.A. administration. No one knows whether President Roosevelt will approve this code, but it forms the basis for action by other industries. The electrical manufacturing industry is now busy preparing its code and some 100 other industries are occupied with this work. There are difficulties reported between the different elements of the administration and a Washington report states the condition as follows:

> The only group that believes unreservedly in the law and is working for its success only is General Johnson and those around him; industry wants increased prices only, labor wants unionization only, Roper and Ickes want political patronage only.

Add to these reports of such diverse interests the caustic and negative editorial expression of Alfred E. Smith to afford a background of controversy whereby positive action in Washington is difficult to obtain. It is a credit to the N.I.R.A. administration, however, to find such prompt action on a specific code and undoubtedly the work will go forward speedily. Statements of policy with respect to simply making jobs or rendering industry inefficient in production by General Johnson have reassured many industrialists that the act will be enforced in a constructive way.

Public works program slow in developing

Vigorous action by President Roosevelt to speed up public works was expected this week. The board of Secretary Ickes has been hard at work defining the policy and procedure for carrying forward the construction program, but certain developments have occurred that have prevented any positive action. There is a disposition to go slow in disbursements in view of the present increase in industrial activities and prices. There is also a tendency, despite the liberal intention of the law, toward strictness in regard to individual projects, as the board becomes more impressed by its responsibility for administering the huge fund. Finally, the selection of state and municipal projects now is subject to pressure and action by the politicians to a great extent, and only projects that have approval of the politically appointed state administrators can be considered by the public works board. Secretary Ickes considers water works and sewage disposal plants as fundamentally necessary, but other projects, such as housing, stadiums, auditoriums and even municipal plants, have not yet been ruled upon as being necessary. With a provision of the law that 70 per cent of a total cost of a project may be borrowed, the board is taking the position that the estimates must be accurate, the security must be good, the budgets must be balanced and there must be evidence that this money will be paid back to the government.

No action has yet been taken by the board on federal projects recommended by government departments and agencies, although these projects are estimated at from 300 to 400 millions of dollars. In the face of these conditions, undoubtedly there will be a tendency to limit the expenditure of funds, such as was evident in the work of the Reconstruction Finance Corporation, unless unusual pressure is exerted by President Roosevelt. In a radio address on July work, Secretary Ickes expressed the belief that pouring money down the pump will start the returning flow, which will mean better times and better prosperity, but he also made it plain that the expenditure of every dollar will be scrutinized closely.

The appointment of L. R. Glavis, Director of the new bureau of investigation in the Interior Department, to serve in the same capacity in the public works administration, indicates that a competent organization will watch every step of the construction program throughout the country. Secretary Ickes stated: "We will seek to safeguard all public works undertaken by us from corruption or graft. We will see to it that works are carefully inspected during their progress. The Administration realizes that it would be improper for it to allow the money of the people to be expended recklessly and extravagantly merely on the plea that it was being spent to make work."

▼

Emergency Rates Permit 6 Per Cent?

On June 30 the Public Service Commission decided that a 6 per cent return on the value of the property was adequate for a company supplying water to Utica. Next came a statement from Commissioner George R. Lunn that emergency rates embodying only a 6 per cent return will be ordered for gas and electric properties pending formal hearings. But Chairman Maltbie stated: "The commission has not laid down any rule which it will absolutely apply to all

cases. We will attempt to deal fairly with every corporation, but no determination has been made of any rule which is to be applied to all corporations before we have examined the facts."

Mayors of the cities in the Albany district on July 1 called upon the commission to order lower rates immediately under the threat of municipal ownership and operation of utilities. The occasion was a hearing on the proposal of the New York Power & Light Corporation to lower gas rates with a prospective saving of $600,000 a year to consumers.

R. J. Le Boeuf, Jr., general counsel for the utility, stated that in 1932 and during the first part of 1933 rates have been reduced voluntarily $1,100,000, including the present proposal. He stated also: "We are not afraid of an investigation. If you give effect to the new federal taxes the rate of return to the company will be about 1.45 per cent."

▼

Illinois Utility Bill Passes

The hotly contested bill to expand the powers of the Illinois commission has passed and now awaits the signature of Governor Horner. Power is given the commission to fix rates, the utilities must prove proposed rates unfair and the cost of rate investigations will be assessed against the utilities with a limit of one-half of 1 per cent of gross operating revenue.

New River Appeal Heard

Arguments in the appeal of the Appalachian Electric Power Company against the Federal Power Commission were begun at Asheville, June 19, in the United States Circuit Court of Appeals.

The case involves the appeal of the power company from a decision of the Western District Court of Virginia, in which Judge Luther Way upheld the Power Commission in granting a limited license to the Appalachian Company in the development of an electric power project on the New River in Virginia.

Irrespective of the outcome, the case, already hanging fire for the past eight years, will go to the higher tribunal.

The Power Commission restated its claim to jurisdiction in answering the appeal of the Appalachian.

The answer, filed in the Circuit Court of Appeals at Richmond, supported the position of the commission, upheld by the lower court, that the river, by reason of its early use and federal and state improvements, is a navigable waterway.

And even though found non-navigable, the commission again maintained, federal jurisdiction is permissible because of the effect the company's proposed hydro-electric power plant at Radford would have on the Kanawha River, an admittedly navigable stream, to which New River is a tributary.

Newton D. Baker, for the power company, attacked the constitutionality of provisions in the federal water power act calling for recapture of licensed power projects, rate regulation and use of excess profits to amortize the recapture price in advance.

He declared a belief that these regulatory requirements are unconstitutional as applied to navigable streams as well as non-navigable ones, therefore as applied to all power projects.

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King Out, Goldberg In; Goodnough Reappointed

Deputy Attorney-General Herman J. Goldberg, Wilkes-Barre, was selected by Governor Pinchot to succeed Dr. Clyde L. King on the Public Service Commission for the term expiring July 1, 1937.

Goldberg's choice was announced a few hours after the Supreme Court in Philadelphia had handed down a unanimous decision ousting King as chairman and member of the commission because the Senate had not acted on his confirmation and the Governor had failed to reappoint him.

Formal appointment of Goldberg is to be made early next month.

Earlier Governor Pinchot announced the reappointment of C. Jay Goodnough, Emporium, as a member and chairman of the commission. Goodnough's term expired July 1. Immediately he takes the oath of office for a full ten-year term, ending July 1, 1943.

Pinchot had designated Goodnough as chairman when he re-appointed him after the adjournment of the Senate, but the controversy over whether King had been ousted by the Governor prevented Goodnough from taking over the duties of chairman.

In announcing his selection of Goldberg, Pinchot said:

"Mr. Goldberg has always been on the people's side and will unquestionably give a good account of himself as a public service commissioner."

Observers and state officials predict that the King decision will end Governor Pinchot's attacks on the regulation of public utilities by the present Public Service Commission, but will not stop his drive for stricter laws governing operation of utilities.

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P. G. & E. to Issue Bonds

Pacific Gas & Electric Company applied to the California Railroad Commission for authority to sell $850,000 par value of its first and refunding mortgage series F 4½ per cent bonds at not less than 93. Proceeds are to be used to reimburse the treasury on account of capital expenditures and advances and loans made to affiliated companies and to retire portions of outstanding funded

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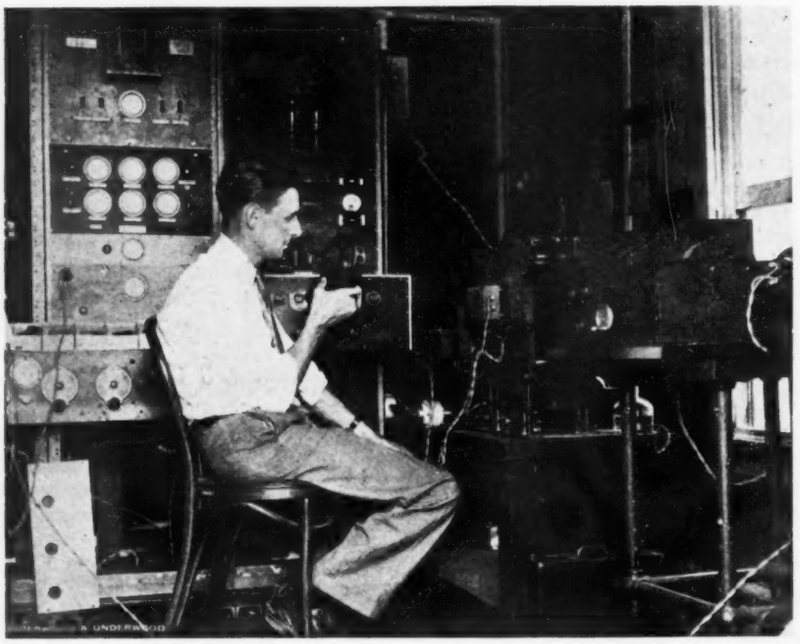
Radio Searches the Sky



Bureau of Standards scientists are searching the upper atmosphere for radio transmission and magnetic data. Radio impulses at several frequencies are sent up by this transmitting apparatus and are recorded when reflected.

indebtedness and finance in part additions to the systems of Pacific Gas & Electric and Mount Shasta Power Corporation.

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Seasonal Rates for Irrigation Advocated

After four days discussion and taking of testimony, the Washington Department of Public Works completed its final hearing on eastern Washington irrigation power rates. E. K. Murray, director of the department, has promised a decision early in July. He states that if a reduction in existing rates is decreed the order will cover only rates for the 1933 irrigation season and will be retroactive to April 1.

Less than 8 per cent return upon the investment of public utilities would destroy credit ratings, power company attorneys brought out at the hearings. State officials contend a 50 per cent reduction in irrigation power rates is possible without noticeable effect on the incomes of the defending companies. The department's engineers also contend that eastern Washington should adopt a seasonal rate rather than a monthly basis for power rates. If the flat rate charge is eliminated, it is claimed, the customer would pay only for what he uses.

James W. Carey, chief engineer of the department, urged the adoption of the California structure of rates, declaring they are more uniform. A report introduced by the department showed the Washington Water Power Company rate for 196 customers, the largest number under any one rate, was 1.575 cents per kilowatt-hour, compared with 1.488 for the same class under the California structure. In an effort to show lack of uniformity in Washington irrigation power rates, Mr. Carey introduced a report showing the Puget Sound company's average irrigation rate is 1.316 cents, Washington Water Power 1.103 and Pacific Power & Light Company 1.423. The same lack of uniformity, Mr. Carey testified, was found in the rate structures of the three companies for all purposes, including domestic and industrial rates. The Puget Sound company's average for all classes, he said, is 1.79 cents, Washington Water Power 1.31 and Pacific Power & Light 2.6 cents.

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I.C.I. Meeting Postponed

Plenary sessions of the International Commission on Illumination, originally scheduled for 1934, have been postponed on account of the world-wide depression and will be held in Germany in June, 1935. It is planned to hold an International Illumination Congress in connection with these sessions.

—And No Midsummer Slump

It is difficult to consider fear as a constructive force. Yet fear was what started the wheels whirling in America's inflation experiment—fear that the few remaining hard-earned and hard-retained dollars would lose their purchasing value—so America bought goods and stocks and commodities and automobiles, all-but-frantically. Fear is still ruling, for it is now decreed, lest the buying revival and speculative movement encounter a seasonal setback, that this year there shall be no summer slump. Industry is to be kept prodded for a whirlwind entrance into a fall and winter campaign.

Here is the tally of the moment. Commodity prices, notably grains, stand at new highs for the depression. General commodity indexes are at a two-year high, 15 per cent above 1932. Car loadings unseasonally sweep above the usual course to well above the corresponding week of 1932. Bituminous coal production is considerably above that of the same period last year. Energy output continues rise and at about 1,600,000,000 kw.-hr. meets the levels of the July 4 holiday weeks of 1929 and 1930. General business indexes approximate the levels of October, 1930. Steel production is well on the high side of 50 per cent.

Hoarding, hopelessly futile with well-oiled presses available, has virtually ceased as is indicated by the currency circulation figures.

Retail trade volumes fluctuate less surely. Volumes at present show, in the case of dry goods activities, that June sales were lower than those of May and that chain stores sales are slightly down. There is a point, perhaps already reached, when the consumer market rejects purchasing when the price rise advances out of proportion to the consumer-buying power.

Federal Power Fixes Chelan River Costs

"Actual legitimate cost" of the Chelan River project in Washington State has been determined by the Federal Power Commission. This project was completed in 1927 and 1928 at a claimed cost of slightly over $11,000,000, of which the commission now allows $9,642,673.63. The disallowances refer almost wholly to the items for interest and taxes.

The licensee, the Chelan Electric Company, according to the commission, had held some of the lands practically twenty years before starting construction of the dam near the outlet of Lake Chelan and the tunnels leading down to the powerhouse on the bank of the Columbia River, giving a head of 395 ft. For most of this time the Chelan company had been a subsidiary of the Great Northern Railway. In 1925 control of the Chelan company was purchased by the Washington Water Power Company as a part of its operating system and the license from the Federal Power Commission was immediately applied for, the federal jurisdiction being predicated on the tracts of public land involved.

Actual construction began in January, 1926, but the order of the commission, recognizing the necessity of making extensive surveys and investigations as well as of acquiring a large number of parcels of lands widely scattered, allows a period of three years prior to the beginning of physical construction as reasonably necessary, sufficient and adequate for such preliminary work. Interest and taxes extending back to 1907 had been claimed, and these claims were presented at the hearing before the commission on May 4 and 6 of this year.

Only two of the five units of the projects have thus far been completed and the commission's order denies the power company's claim that a proportion of the initial investment be carried in suspense after the first unit was completed. This theory of charging up interest and taxes on "unused capacity" is rejected as not in conformity with the federal water-power act and unsound in principle.

The opinion, written by Chairman Smith, comments on the unusual character of the licensee's accounting statement for this project in that it shows a gratifying freedom from the troublesome items that so commonly arise from intercompany transactions under contract or agreement, the parties to which are closely affiliated by common ownership or control.

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Insull Insurance Offer Approved for Receivers

Receivers for the Middle West Utilities Company have received the approval of Federal Judge Walter C. Lindley for a $55,000 settlement under a $200,000 insurance policy with Lloyd's of London to cover dishonest acts of employees. The settlement was made in connection with case of Samuel and Martin Insull on claims said to run into millions of dollars.

The court also approved an agreement between the receivers and Halsey, Stuart & Company whereby the receivers recognize a claim of $2,500,000 against the company and procure the return of one-half of the collateral deposited by Middle West against loans from Halsey, Stuart & Company within four months of the time Middle West went into receivership.

The time limit for filing claims against the Middle West Utilities Company was extended by the court from June 30 to September 30.

Coming Meetings

Illuminating Engineering Society—Delavan, Wis., August 28-31. D. W. Atwater, 29 West 39th St., New York.

International Association of Electrical Inspectors—Chicago, Ill., September 11-15, V. H. Tousley, 612 No. Michigan Avenue, Chicago.

National Electrical Exposition — New York, N. Y., September 20-30. Ralph Neumuller, 480 Lexington Ave., New York.

National Association of Railroad and Utilities Commissioners — Cincinnati, Ohio, October 10-13. James B. Walker, 270 Madison Ave., New York.

Association of Iron and Steel Electrical Engineers — Pittsburgh, Pa., October 17-19. John F. Kelly, Empire Building, Pittsburgh.

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St. Louis Ruling Protested by Consumer and Utility

Both the May Department Stores, Inc., operator of the Famous-Barr Company in St. Louis, Mo., and the Union Electric Light & Power Company have filed exceptions to the recommendation of Special Commissioner Charles P. Williams that Circuit Judge Henry Hamilton award the May company judgment for $111,938.54 for alleged overcharges for electric current used between May 1, 1925, and December 31, 1931. The May company in its exceptions held the award recommended by Master Williams to be inadequate and that it should receive $614,025, and also that the master erred in allowing the Union company $65,435 for maintenance and supplying steam heat.

The exceptions of the power company state that the issues involved in the dispute are matters over which the Missouri Public Service Commission has exclusive jurisdiction. It contends also the allowance for steam heat should have been $338,778. Prior to acting on the report Circuit Judge Hamilton will hold a hearing on the exceptions.

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Kansas Accounting Order May Extend to Utilities

Telephone companies serving 75 per cent of the subscribers of the state are affected by an order of the Kansas Corporation Commission relating to uniform accounts which became effective July 1. This order requires large companies to keep their fixed capital, operating revenues and operating expenses so as to permit them to show separately the following: (1) All items applying to each individual telephone exchange; (2) all items applying to each toll system, and (3) all items common to more than one exchange or toll system.

That a similar new order may include electric distributing companies and gas distributing concerns also is indicated by N. A. Anderson, chief engineer of the corporation commission, who states: "The commission has undertaken a revision of the uniform system of accounts for electric companies, in addition to the telephone companies. This anticipated revision is to include the same provisions as the order affecting the telephone concerns, in respect to the matter of keeping accounts by unit or distribution plant."

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New York Commission Pleases Neither Side

Though excitement ran so high that Chairman Maltbie called for the presence of a police officer at hearings into the rates and practices of the New York metropolitan utility companies last week neither side seems satisfied that complete justice has been done. It was at a Brooklyn hearing that one man, claiming to represent the District Attorney as "engineer," was so active in his participation as to lead to the calling of a patrolman.

Governor Lehman, in answer to petitions of various kinds by protestants whose requests have ranged from those for the calling of a special session of the Legislature to cope with the utility situation of the state to the removal of the chariman of the commission for alleged insufficiencies, has refused all such pleas. In a formal answer to the charges against him Mr. Maltbie refuted the various allegations.

Prendergast comments

William A. Prendergast, for some years chairman of the New York regulatory body, has, within a few days of his resignation as vice-president of the Long Island Lighting Company, appeared as author of a book which points to the gravity of the politico-regulatory-utility situation in these words:

"It is not too much to say that upon effective regulation of the electric industry may hang the future of the American economic system.

"The American people should realize that the contest over this one industry is a crucial and significant one, implying contests over other industries in the future and involving the whole principle of private enterprise on which our economic system is built.

"The best answer to the public ownership attack on the electric industry is for that industry under private ownership to keep its finances sound and to furnish to the American people the maximum service at rates that are as low as justice to investors permits.

"The strengthening of regulation by public service commissions is essential."

More salary lists

Public utilities of the New York metropolitan area had an average net return on their capital stock and surplus of 8.3 per cent in 1932, according to testimony introduced at rate hearings last week. Another list of salaries paid was introduced by Col. Charles G. Blakeslee, counsel for the commission. These showed:

E. L. Phillips, president Long Island Lighting Company, $70,000 (three companies); W. A. Prendergast, vice-president Long Island Lighting, $50,000 (three companies); George W. Olmsted, vice-president, $32,500 (three companies); Lewis A. Howland, vice-president Queens Borough Gas & Electric Company, $19,800 (one company); Frank J. Stoltz, vice-president Long Island Lighting, $25,000 (one company); Fred H. Maidment, $28,600 (two companies), and A. J. Gonnoud, president Kings County Lighting Company, $27,500 (one company). Others were listed in ELECTRICAL WORLD, July 1, page 5.

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Michigan Commissioner Seeks Court Order

Alleging that his fellow commissioners are attempting to build up a bad record for him by making it appear that he is willfully absenting himself from meetings, Edward T. Fitzgerald, Detroit member of the Michigan Public Utilities Commission, has filed a petition in the Michigan Supreme Court for a writ of mandamus compelling his four colleagues to let him know when and where commission meetings are to be held and to grant him access to files, reports and other documents. The court gave the defendants ten days to show cause why a petition should not be granted.

Various bills introduced in the last session of the Legislature to do away with the present commission did not reach the floor and since the close of the session Governor Comstock has been urged to oust all five commissioners. Their terms run to June 18, 1935.

Kit F. Clardy, chairman of the commission, had an audience with the Governor following the filing of the petition, but after hearing the chairman's version of the long-established feud, the Governor said he had not made up his mind and that "I guess I'll let it ride along for the present."

The break between Fitzgerald and the other members resulted largely over the Detroit Edison rate hearings and a petition for a pipe line from the gas fields.

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Silvray Lamps for St. Paul

Contract for maintenance of the street lighting system of St. Paul, Minn., has been awarded to the Welsbach Street Lighting Company of America. In the 10,000 electric units in that city Welsbach-Silvray lamps will be used.

G.E. Conference on Recovery Act

A three-day conference to formulate plans for immediately tying in with the national recovery act, recently passed by Congress, will be held in Bridgeport, Conn., at the General Electric Company plant, starting August 7. More than 300 officials of General Electric distributors from all of the 48 states will be in attendance. Gerard Swope, president of General Electric and chairman of the newly formed industrial advisory committee, will be the principal speaker.

In commenting on the conference, C. E. Wilson, vice-president of General Electric and head of the Bridgeport works, stated: "In my estimation this conference marks a step forward in industry." The purposes of the national recovery act are to establish a rising spiral of employment, sales, purchasing power, and immediate action is therefore necessary to start this spiral working with workers.

Other speakers tentatively scheduled to attend are Dr. Charles Eaton, Representative in Congress from New Jersey; Bruce Barton, author and advertising man, and Charles Francis Coe.

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Code of Practices for Hoist Manufacturers

The Electric Hoist Manufacturers' Association, at its meeting held at the Hotel McAlpin, New York City, on June 27, appointed a committee, consisting of F. A. Hatch, president of Shepard Niles Crane & Hoist Corporation, Montour Falls, N. Y.; F. F. Seaman, general manager hoist and crane division of Robbins & Myers Sales, Inc., Springfield, Ohio, and J. G. Worker, general sales manager of American Engineering Company, Philadelphia, Pa., to draft a code of practices for the electric hoist manufacturing industry.

This code will be presented to the membership of the association for adoption at an early meeting, after which it will be submitted to the administration at Washington for the President's approval.

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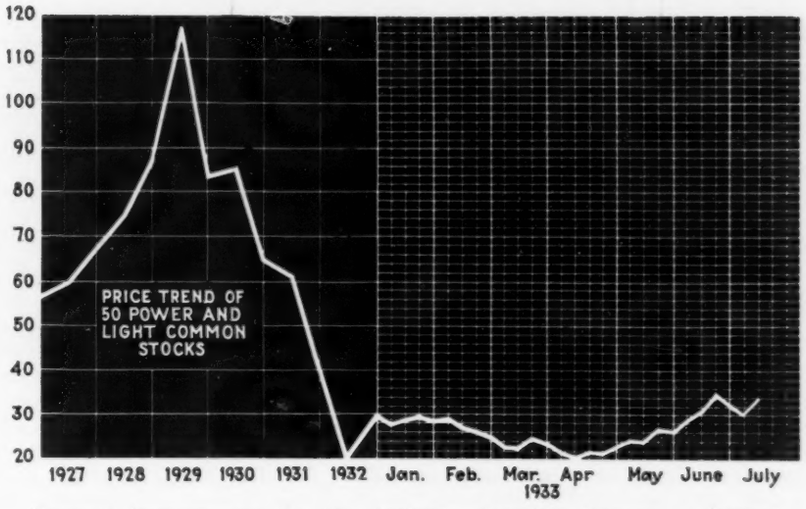
Penn Southern Power Takes Over Insull Utilities

Despite earlier opposition (ELECTRICAL WORLD, June 10, page 738) the Penn Southern Power Company, representing control of the erstwhile Insull Penn Central Light & Power, Michigan Electric Power, Georgia Power & Light, Tide Water Power and Florida Power companies, has gone through to establishment.

James A. Hill has been elected president of the new organization. He is a member of the advisory board of the New York Trust Company and a director of the American Water Works & Electric Company and several of its subsidiaries. Other officers will be chosen shortly. The board of directors is composed largely of members of the board of American Water Works, though it is said that there is no definite connection between the new organization and the older company.

Utility Stocks Advance



General improvement in the business situation became a factor in the securities market this week and stocks, bonds and commodities advanced sharply. "Electrical World" index 33.6, as compared with 30.9 last week.

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Federal Trade Hearing Shows Further Write-Ups

Little of basic interest or significance has developed at the Federal Trade Commission hearings of the last few weeks. Gas units of the Cities Service group were reported upon by commission examiners. A paper profit of $1,600,000 to the holding company was reported through the construction of a steam plant at Valmony, Colo., in which the Public Service Company of Colorado figured. J. Henry Roraback, president of various Connecticut utilities, appeared before the commission.

Some unrealized profits

Profit of $8,898,848 on the sale of its investment in the Eastern New Jersey Power Company to the National Public Service Corporation was made by Utilities Power & Light Company, testimony before the Federal Trade Commission revealed. On April 30, 1931, the corporation's investment in the Eastern New Jersey Power Company, including construction advances of $3,641,251, was sold to National Public Service Corporation for $15,620,100, which resulted in the above-mentioned profit, according to a report submitted by H. O. Day, commission examiner.

The corporation also netted a profit of $572,243 on the sale of the Indiana Power Company, Consumers Power Company and the Knox & Sullivan Electric Light & Power Company in 1924 to the Interstate Public Service Company, also of the Insull group. The price obtained for these properties was $2,613,874.

In the sale of the New Jersey properties, however, Utilities Power & Light received in payment from the National Public Service notes due in 1932 and 1933 amounting to $4,215,075 which may not be paid as the latter corporation is now in the hands of receivers, Mr. Day stated.

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Westinghouse Gives Pay Increase

Notice of an immediate raise in salaries and wages has been received in all offices, works and subsidiary companies of the Westinghouse Electric & Manufacturing Company.

Mr. Merrick's statement follows: "Conforming to the effort of the government to raise the purchasing power of those dependent on industry for their income, we announce the following:

"Effective July 1, 1933, and continuing until further notice there will be an increase of 5 per cent in the rate of pay of each individual employee. This applies to both salary roll and hourly roll rates and includes employees of all subsidiary companies."

Output of 1931 Surpassed

Electrical energy production during the last week in June broke another record in surpassing that of the nearest corresponding week in 1931, that of June 27, and thereby coming within 3 per cent of the maximum for that week in any year in the history of the electric light and power industry. Less than two months ago the curve for 1932 was crossed for the first time. Now, with an output of 1,655,843,000 kw.-hr. for the week ended July 1, according to the Edison Electric Institute, the corresponding figure for 1932 is exceeded by 13.7 per cent. The gain since the low week in March exceeds 20 per cent.

Regional gains, except on the Pacific Coast, exceed anything recorded in recent years. They range from 20.9 per cent in New England to 11.1 per cent in the Middle Atlantic region. In the Central area the severe losses of 1932 have been more than wiped out. The Pacific Coast is approximately at last year's level.

Weekly Output, Millions of Kw.-Hr.

Week ended	1933	1932	1931	1930
July 1	1,656	1,457	*1,607	*1,594
June 24	1,598	1,441	1,635	1,704
June 17	1,578	1,442	1,610	1,698
June 10	1,542	1,435	1,621	1,707
June 3	1,461	1,381	1,594	1,657

*Includes July 4 holiday.

Per Cent Change from Previous Year

Region	Week Ended July 1	June 24	June 17
New England	+20.9	+19.2	+18.2
Middle Atlantic	+11.1	+ 8.9	+ 7.0
Central industrial	+17.6	+13.9	+11.9
Southern States	+17.1	+13.8	+13.6
Pacific Coast	— 0.3	— 0.6	— 1.4
United States	+13.7	+10.9	+ 9.5

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First Output Gain in Three Years

In May, for the first time in 37 months, the production of electrical energy in the current month was greater than in the same period of the preceding year, the U. S. Geological Survey reports. Output of all public utility plants is given as 6,964,000,000 kw.-hr., which is 5 per cent more than in 1932.

April production in 1930 was 2 per cent greater than in 1929, but in each succeeding month there was a decline compared with the year before. This continued until April of the present year, when the decrease was still 5 per cent. The abruptness of the change is seen also in the average daily production, which rose more than 4 per cent from April to May, whereas the normal change is a decrease of about 2 per cent.

Water power contributed 48.5 per cent of the total, the highest percentage ever reached.

As compared with last year every region except the Pacific Coast showed an increase, rising in the South Atlantic states to 16 per cent, and in New England to 10 per cent. By contrast, in April every one of the nine geographical divisions had reported a decrease.

▼

Energy Supply in Belgium Shows Increased Capacity

As reported by the *Bulletin de l'Union des Exploitations Electriques en Belgium* the installed capacity of the various central stations there amounts to 1,360,000 kva., as compared with only 1,285,000 kva. in 1931, an increase of 5.5 per cent. The output of the affiliated stations in the interval underwent a decline, however, owing to the industrial depression, from 1,714,000 to 1,585,000 kw.-hr., a drop of 7.5 per cent. Including the power purchased from non-affiliated plants, the total output fell from 1,804,000 to 1,685,000 kw.-hr.

Energy was supplied to 1,925 communes, an advance from 1,910 in the preceding year, the number of consumers of current for lighting purposes increasing from 1,100,000 to 1,125,000, and those for high-voltage service from 2,830 to 2,900. It is estimated that of the power supplied 60.1 per cent is used for primary service, 9.4 per cent for private lighting and household appliances, 0.8 per cent for public lighting, 5.2 per cent for secondary power supply, 9.1 per cent for traction purposes, while 15.4 per cent is supplied for distribution by municipal authorities and communal associations.

The affiliated concerns now operate 3,550 miles of overhead high-tension cables, 4,782 miles of underground high-tension cables, 14,187 miles of overhead low-tension cables and 1,562 miles of underground low-tension mains.

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Ontario Hydro Investment Averages $398 per Kw.

Investment in the system operated by the Hydro-Electric Power Commission of Ontario is nearly $400,000,000, it appears from the 25th annual report of the commission. The report, a volume of 481 pages, contains a mass of statistical and other information from which a few items have been abstracted. The following data are for the year ended October 31, 1932:

Investment
- Power and hydro-electric railways $273,248,830
- Investment of municipalities. 109,309,934
- Total 382,558,764

Rating in electrical horsepower
- Rating of generators..... 1,218,620 hp.
- Normal plant capacity..... 1,255,565 hp.
- Contract power ..... 504,487 hp.
- Total ..... 1,760,052 hp.

Output generated .. 2,900,527,027 kw.-hr.
Purchased ..... 1,307,946,155 kw.-hr.
- Total ..... 4,208,473,182 kw.-hr.

Transmission miles
- 220,000 volts, steel-supported..... 704
- 132,000 volts, steel-supported..... 189
- 110,000 volts, steel-supported..... 867
- 110,000 volts, wood-supported..... 212
- Total, 220,000 volts and higher... 5,124

The total investment includes about $10,000,000 in electric railways. Omitting this and certain other items leaves a balance-sheet total of $261,492,699, which, combined with the investments of municipalities, makes the aggregate assignable to generation, transmission, distribution and sundry property used directly for the electric power system $360,802,633.

This is equivalent to $296 per electrical horsepower of generator rating in the 38 developments operated by the commission, or $398 per kilowatt.

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Alabama City Votes Municipal

By a vote of 10 to 1 the citizens of Florence, Ala., have authorized the City Commission to go into the power business, either by constructing a new distribution system or by purchase or condemnation of the existing plant.

Malcolm Muir Joins Recovery Administration

Gen. Hugh S. Johnson, Administrator for the National Recovery Administration, has proposed the appointment of Malcolm Muir of New York as a deputy administrator and of Prof. Alonzo E. Taylor of Stanford University and Lucius R. Eastman of New York, president of the Hills Brothers Company, as members of the Consumers' Advisory Board.

Mr. Muir's appointment represents a "horizontal" cross-section of industry, due to his intimate acquaintance with the problems of the "capital goods" and machinery groups as chief executive of the McGraw-Hill magazines and past-president of the Associated Business Papers (the trade association of the business press). Mr. Muir was also a member of the National Committee for Industrial Rehabilitation and chairman of its New York Board, thus having been active in industrial recovery a year before the new law was enacted. Mr. Muir is also director of the National Publishers' Association, the American Arbitration Society, the Advisory Board of the Army Ordnance Association for the New York district and a director of the Merchants Association of New York.

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More Rented Washers Installed by Apartments

Further extension of the rental washing machine idea for apartment houses (ELECTRICAL WORLD, April 1, page 408) is reported from Chicago, where 475 apartment buildings have been so equipped by one manufacturer in the past 60 days. Installations are being made in 25 other cities.

In general, one household washer installed in the basement is sufficient for the needs of the average Chicago apartment house. In a few of the largest structures that have been equipped it was found that two or more machines were required. Each washer is outfitted with a coin-operated meter set to run the washer twenty minutes for a dime. Since the average family washing can be completed in one to one and one-half hours' use of the machine, the cost to the housewife rarely exceeds 30 or 40 cents. The landlord pays for energy.

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Job Seekers Warned Off by Tennessee Authority

Reiteration of its previously announced policy in regard to employment in Tennessee Valley has been made by the Tennessee Valley Authority, which points out that the river basin is not intended to be a reservoir for the unemployed of other sections. Wherever possible, available work will be given to the jobless of the region where such work develops.

"The board is very anxious that word does not go out which would induce people looking for employment to come into the region of Muscle Shoals or Cove Creek," states David E. Lilienthal, member of the board of directors, explaining: "There is no present need for outside help. Besides, it is planned to use people from the immediate territory. There are probably ten times more unemployed in that area than can be used on initial projects."

Many persons have returned to the valley because they lost jobs in the cities and outside industrial areas. "We have them back in the hills with nothing to occupy them whatsoever," says Chairman Arthur E. Morgan, adding: "They merely sit there and wait for a job. What we want to do is to fill this need."

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Virginia Hydro Proposal Made to Commission

That the Kanawha Canal properties of the Chesapeake & Ohio Railway be transferred to the Appalachian Electric Power Company and, later, the construction of a hydro-electric plant at the Lynchburg Dam of the old canal is suggested in plans just laid before the Virginia state Corporation Commission in a joint petition of the railroad and the utility company.

The petition makes clear that the complete abandonment of the historic canal is contemplated, although such action will not, under the proposals, be undertaken unless all private leases on the canal are purchased or otherwise terminated by the power company. Under an agreement between the C. & O. and the power company the latter has agreed to purchase the canal properties for the sum of $125,000.

The Kanawha Canal, property of the C. & O. for more than 50 years, was constructed about 1830 and was intended for a leading artery of water trade from the falls of the James River at Richmond to the city of Lynchburg.

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Refrigeration Bureau Shows Effect on Earnings

America's unparalleled and sustained yearning for electric refrigeration, reflected for some months in the sales of many manufacturers and in the over-all production reports of the refrigeration bureau of the Edison Electric Institute, has had its effect upon the earnings of at least one manufacturer. Current quarter operations of Kelvinator Corporation went decisively into the black. While lower prices than a year ago prevailed during this period, there are factors such as lower costs and operating economies which more than offset the reduction in prices.

Unit shipments during the three months ended June 30, 1933, the third quarter of Kelvinator's fiscal year, will show around 75 per cent increase over the like period last year, when net profit amounted to $730,002, or 63 cents a share on 1,147,302 shares of capital.

For the first half of its fiscal year Kelvinator reported a net loss of $660,882. Indications are that the current quarter's earnings will create a balance that will compare favorably with the results of the third quarter last year.

The July production schedule calls for an output equal to that of the entire final quarter of the 1932 fiscal year. Higher prices, ranging from $1.50 to $50 a unit, have gone into effect on all factory shipments. The last quarter also will benefit from favorable inventory and other year-end adjustments.

Major New Construction This Week

Motors, controls, hoists, electric trucks, power substation equipment, conveyors, etc., will be required for new plant at Oakland, Calif., of Standard Brands of California, Inc. A $500,000 project.

Wichita Falls, Tex., is arranging fund of about $300,000 for city-owned electric light and power plant.

Cloverdale Brewing Company, Baltimore, Md., plans brewery with power house, refrigerating plant, etc., at cost of over $300,000.

Machine drives, motors, controls, conveyors, etc., will be installed in addition to Topton, Pa., plant of Klein Stove Company. Cost about $100,000.

Yoerg Brewing Company, St. Paul, Minn., has approved plans for expansion and improvements. Cost over $100,000.

Transformers, substation equipment, pumping machinery, motors, hoists and conveyors will be purchased by Gulf Industries, Inc., Pensacola, Fla., Harvey W. Corbett, 130 West 42d Street, New York, architect, for new shipbuilding repair plant and steel fabricating works. Fund of $30,000,000 being arranged.

Clayton, Mo., plans installation of street-lighting system and underground electric distribution system. Estimated $100,000.

Blatz Brewing Company, Milwaukee, Wis., plans additions and extensions to present plant. Cost over $400,000.

Olyphant, Pa., authorized to arrange bonds for $100,000 for extensions and improvements in city-owned electric light and power plant.

New York Metal Prices

	June 27, 1933 Cents per Pound	July 5, 1933 Cents per Pound
Copper, electrolytic	8.00	8.50
Lead, Am. S. & R. price	4.20	4.30
Antimony	6.50	6.50
Nickel ingot	35.00	35.00
Zinc, spot	4.70	4.95
Tin, Straits	45.37	47.00
Aluminum, 99 per cent	23.30	23.30

As to Rates——

• Central Hudson Gas & Electric Corporation, completing a revision of its general rate structure to involve a total reduction of approximately $250,000 a year to all classes of customers, has made effective a lower schedule for large power users estimated to mean $39,000 a year to them.

• Louisville Gas & Electric Company, in settlement of approximately 100 suits filed or drawn against it by local power users, claiming overcharges above the monthly minimum horsepower rate, has compromised and refund checks have been issued to some 250 industrial consumers, involving a total of $35,000. The compromise was made on the basis of a 20 per cent refund on alleged overcharges for as much as five years back and 50 per cent of such charges for 1932, in addition to 6 per cent interest for the period covered.

New York emergency reductions

• New York State Electric & Gas Corporation, under orders from the New York Public Service Commission, will reduce its rates for electric service by an aggregate $600,000 a year by August 1. The reductions are based upon the computation by the commission of a 6 per cent return on the book value of the company's property and will return less than 6 per cent on the stated value of the common stock averaged for the years 1931 and 1932. The order is effective for one year and is subject to reconsideration at the end of that time.

• New York Public Service Commission, pursuing its policy of "emergency" reductions, possibly on a state-wide basis, has under investigation many of the state's utilities. Chairman Maltbie of the regulatory body, in explaining the 6 per cent valuation basis assumed for the Associated Gas & Electric property mentioned directly above, has denied that any set rule has been developed for general application.

"Thus far the only determinations made by the commission regarding temporary emergency rates are that the utilities will be thoroughly investigated to ascertain whether the facts regarding each company, considered in due course, justify the establishment of temporary emergency rates," Mr. Maltbie said.

Commissioner Lunn, who presided at the up-state hearings, was more explicit. "As a general rule, all companies making more than 6 per cent will be ordered to reduce their rates," he said, "if they are making slightly more than 6 per cent a reduction probably would not be worth while." Mr. Lunn made it plain that the 6 per cent basis was to be used only in emergency rate reductions.

•Peoples Power Company, subsidiary of United Light & Power Company, has accepted the orders of the Illinois Commerce Commission to reduce rates by amounts which will save consumers an estimated $175,000 annually. Reductions ordered amount to 14 per cent for residential consumers, 17 per cent for large power users and 18 per cent for commercial users. Company officials state that while they think these reductions excessive, they are willing to try them out.

• Iowa Southern Utilities Company, operating in more than 100 communities in southern Iowa, has announced general rate reductions effective July 1.

•New York State's Public Service Commission, launching a drive against gas rates upon a base similar to that under which electric energy charges have been assailed in a state-wide plan, opened gas hearings this week.

•System-wide appraisal of the properties of the Northern Indiana Public Service Company has been ordered by the Indiana Public Service Commission as the next step in considering petitions of South Bend, Hobart and other cities. Mole Cook, member of the commission, announces appraisal of the entire system will be made for the purpose of determining whether the municipality or the system shall be the unit for rate making and whether the emergency rates in South Bend should be made permanent. Heretofore the commission has operated under the policy that the municipality should be the unit for rate making.

•Northern Connecticut Power Company has filed new electric rate schedules with the State Public Utilities Commission in compliance with orders issued in May. These rates have been approved and will result in a saving of $35,000 to customers. An analysis of the schedules shows 90 per cent of all customers will be benefited. No rates will be increased.

•Governor White of Ohio has under consideration a petition originating in Cleveland asking the removal of the members of the State Public Utilities Commission on the grounds of "inefficiency, neglect of duty and malfeasance in office."

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N.E. Commissioners Meet

Regulation of interstate power by the compact method instead of by Washington was favored at the annual meeting of the New England Association of Public Utilities Commissioners. By this method commissioners representing interested states have jurisdiction over interstate power contracts. Connecticut, Massachusetts and New York have passed laws in favor of this plan or are about to do so. Other topics discussed included the possibilities of readjusting rates to offset the burdens of increasing taxation. Richard T. Higgins, chairman of the Connecticut commission, was elected president, succeeding Albert J. Stearns of the Maine commission.

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Brooklyn Edison Wins Labor Policy Decision

After several months of hearings and deliberation the New York State Public Service Commission has discussed the complaint of "25 or more customers" against the labor policies of the Brooklyn Edison.

As the first intrusion of regulatory authority into the labor field this complaint created wide interest (ELECTRICAL WORLD, June 10, page 737, and preceding).

Commissioner George R. Van Namee in his report approved by the commission stated:

"A thorough investigation of the evidence leads to the conclusion that no inadequacy of service or lack of safety was shown. Nothing has been developed that warrants further proceeding."

"Affected" vs. "endangered"

Informed of the decision, Jerome Count, counsel for the National Committee on Utilities and Labor, who represented the complainants, denied the complaint had stated that the company's policies had affected the adequacy or safety of service.

"Our charge was that arbitrary, unjust, unreasonable and unlawful methods and practices were endangering the adequacy and continuity of electric service," he said.

It was argued that almost 5,000 men had been laid off in the last two years, although the company had many feet of lines to be placed underground and money to finance such work. In this connection Commissioner Van Namee said:

"No evidence was offered to contradict that offered by the company to the effect that the methods employed in overhead construction were of the best character and in accord with the standards prevailing in the trade, or that accidents were more frequent on overhead than on underground construction."

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Electric Utilities Auction

In default of interest since December 1, 1931, and of principal since February 7 of this year, the trustee for the fifteen-year 6 per cent secured gold bonds of the Electric Public Utilities Company announces that the collateral securing the bonds will be sold at public auction in one lot. Collateral consists of 25,000 common shares of Electric Public Service Company, declared by the Secretary of State of Delaware for non-payment of taxes; 1,000 common shares of

Empire Southern Gas Company and 989 common shares of Louisiana Ice & Utilities, Inc.

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Laclede-Utilities Power Suit Granted Rehearing

Because of the importance of the regulatory principles involved Division No. 2 of the Missouri Supreme Court has granted a rehearing and transferred to the court *en banc* the case in which the Utilities Power & Light Corporation of Chicago is seeking authorization to take over direct control of the stock of the Laclede Gas Light Company and the Laclede Power & Light Company of St. Louis.

Utilities Power & Light Corporation sought to buy stock control of the two companies from the Laclede Gas & Electric Company, a holding concern which it also controls. The Missouri Public Service Commission authorized the transaction, but this ruling was reversed by Division No. 2 several weeks ago (ELECTRICAL WORLD, April 29, page 533). It held that benefit to the public must be shown before a holding concern can be permitted to obtain control of an operating public utility in Missouri.

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Delays on the Tennessee

While plans for the construction of the Cove Creek Dam will be completed by the Army Corps of Engineers late in July, it will be six months or more before construction actually gets under way, according to A. E. Morgan, chairman of the Tennessee Valley Authority. Dr. Morgan states that no consideration has been given to the building of a transmission line from Muscle Shoals to Cove Creek, since the policy involved has not yet been defined.

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Frigidaire in Heavy-Duty Field

Entrance of Frigidaire Corporation into the field of heavy-duty air-conditioning equipment has been announced. The company is introducing nationally large capacity equipment designed to handle the air-conditioning loads required for theaters, office buildings, apartment buildings, retail commercial establishments and large residences. Frigidaire has been active in the air-conditioning industry since January, 1932, when it entered the market with unit equipment for domestic and commercial purposes.

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More Electric Welding

Sales of welding electrodes are among the indicators that reflect the effects of increasing activity in the metals industries. As announced by the National Electrical Manufacturers Association statistics of such sales to agents and consumers, based upon reports from eighteen companies, show a gain of 24 per cent in April compared with the average of February and March and of 13 per cent over January.

Monthly sales were as follows: January 2,228,002 lb.; February, 1,973,163; March, 2,062,677; April, 2,509,226.

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St. Louis Contractor Sues Over Trade Restraint

Leo T. Barrett, electrical contractor of St. Louis, Mo., has filed a suit in the St. Louis County Circuit Court under the Missouri anti-trust statutes asking $60,000 damages from four electrical companies, a local union of electrical workers and 30 individuals. The petition alleges the defendants to have formed an organization in restraint of trade and claims his business to have been damaged as a result. Under the anti-trust law he is entitled to recover thrice the amount of damages suffered. Barrett charges the defendants to have combined to control bidding on local electrical work and also the labor that was used on electrical construction of all kinds.

In the United States District Court in St. Louis on May 7, 1932, United States District Judge Charles B. Faris held in a $150,000 damage suit that Barrett had against a union labor leader and 41 other defendants that the pleading in that case was not sufficient as to alleged interference with interstate commerce and dismissed the action.

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Associated Option Plan Seen Fair and Needed

By letter and through newspaper advertising, debenture holders of the Associated Gas & Electric Company are being advised by the management of its viewpoint in the proposed plan for rearrangement of the company's debt capitalization. That the plan is fair is the contention of the company in citing the flexibility and freedom over a period of time which those adopting the three options may secure. That it is a necessary plan is the advice of President J. I. Mange, who cites recent developments in rate, tax and security situations of utilities to prove his point.

While the consolidated net earnings of Associated after depreciation and all charges of subsidiaries for the year ended March 31, 1933, were $2,413,749 over fixed interest requirements for the debentures for that period, this margin was only $584,517 after deducting accruals for the new federal capital stock tax. Additional burdens cited are the federal energy tax ($1,100,000) and New York state rate reductions ($600,000). The aggregate of actual and potential increases in taxation and rate reductions is cited as $3,500,000.

To transfer the interest on the debentures from a fixed basis to an income basis is the proposal which the management points to in the debt reorganization plans and which it offers that "in the event of temporary inability to meet full interest charges defaults will not occur which might lead to a receivership, with its attendant expenses and risks."

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Gatineau Damage Suit Brings $350,000 Award

Dragging through the Quebec Public Service Commission, Superior Court, Appeal Court and Supreme Court, to be finally placed in the hands of Justice deLorimier by a special act of the Quebec Legislature, the $1,140,458 claim of Freeman T. Cross against the Gatineau Power Company has been ordered settled for $348,481. Damages involved were the flooding and destruction of Mr. Cross's lands and property by the company's dam at Chelsea Falls.

Originally, Mr. Cross claimed $1,140,458, while the company offered him only $48,800 in full settlement of his claim. Justice deLorimier confessed himself somewhat at a loss to understand this $1,000,000 discrepancy between the estimates of the two parties. The company, he pointed out, arbitrarily possessed itself of Cross's property at Chelsea Falls, erected a dam, raised the river level and flooded Cross's holdings.

The plaintiff first claimed $600,000 in the Superior Court, and while the case was under way before the trial judge the dispute was carried to the Quebec Legislature in a bill empowering the Gatineau Power Company to proceed with its development, but ordering that the case be reopened in the Superior Court and a fair indemnity fixed as payment for plaintiff's right. He then made a new claim, estimating his damages at $1,140,458, including the actual loss from the raising of the river level and the costs and disbursements incurred in court proceedings.

In fixing the indemnity at $271,500 for the properties Justice deLorimier included $60,000 for hydro-electric plant and distribution system, $115,000 for the flooding of two sawmills and timber properties, $5,400 for depreciation of timber limits, $100 for a gravel pit and $1,000 for loss of gravel and $76,981 for costs and disbursements, which brought the total to $348,481.

If the company does not pay this amount, with interest, within fifteen days Cross is empowered to open the gates of the power dam at Chelsea Falls and release the water which is flooding his property.

EDITORIALS

L.W.W.MORROW
Editor

A. I. E. E. maintains position

ABLE management and wise policies have enabled the American Institute of Electrical Engineers to maintain its position and influence during the depression. At Chicago last week many expressions of commendation and loyalty were heard. Those who pressed loudest for an expansion of institute activities in the boom period now accepted with pleasure the proof that a professional society has very limited functions in the economic and commercial realm.

Now as before the institute rests upon the work of the sections and branches and its major national function is to afford an outlet and a forum for the technical contributions of its members. It is not a trade association. It is not an organization that requires a bureaucracy at headquarters to exploit commercial, political and publicity possibilities. Only in a professional way and for professional purposes does it participate in national affairs. In this day of stock taking it is indeed a pleasure to commend this splendid record of the institute. Moreover, the meeting at Chicago gave ample evidence that past policies will be continued and strengthened. Splendid papers, good discussions, announcement of new policies and the election of professional electrical engineers as the new officers —these indicate the vitality and the standards that should be maintained.

During the coming year the institute has an unusual opportunity to strengthen its position and to contribute to national welfare. The dissolution of N.E.L.A. means an increased need for an engineering forum in the institute. The development of movements for advancing the professional status of engineers, the changes called for in engineering education and the many new technical developments in apparatus and assemblies call for institute participation. The technical committees this year should be staffed by the ablest engineers available and should develop their program to conform to the needs of the times. Undoubtedly this will be done.

A foolish exhibition

THE joint meeting of the professional engineering societies at Chicago to discuss the St. Lawrence project was ill advised, unprofessionally developed and badly handled. The paper by Dr. Mead was a digest of reports made at different times and under different assumptions as to costs and led to misleading conclusions. Nor had the author made a field study of the project. Such a paper should not rate the prominent position given it, especially as it contained aspersions, conclusions and challenging statements unsupported by convincing economic and engineering evidence. A professional society paper on the St. Lawrence should have been presented by engineers who knew the project in detail and who had served on the engineering boards that studied the conditions thoroughly.

Add to the doubtful professional validity of the presentation a discussion entirely out of keeping with a joint meeting of the professional societies. Propaganda personalities and selfish interests have no place in this professional forum, yet they

abounded. After attending the meeting one wonders why the foolish exhibition was held and how the professional societies were drawn into such a political cesspool. The St. Lawrence project is worthy of engineering discussion, but surely this meeting did not meet professional specifications.

Load building in these new conditions

LOOKING back on the E.E.I. convention in Chicago, impressions gain strength. One of the strongest was the review of the present possibilities for load development. In a series of papers and playlets the picture was painted across two sessions. Load building is now a necessity, not an option.

The greatest enemy of progress is complacency. True, there are four classes of customers—domestic, commercial, industrial and rural. The power company sells them electricity for light, heat and power. The story has been told over and over again. Everybody has been asked to buy. And the selling tends to grow into a habit of just keeping on, punctuated and flavored with short bursts of organized campaign enthusiasm for this or that. So the thinking of both management and sales personnel falls into a rut. Activities become a cycle of routines. And the idea prevails that, after all, the problems and technique of load building are always about the same.

But as a matter of fact nothing about selling is the same. Times have changed. People are vastly altered from four years ago in their attitude toward economy and comfort. Conditions in the home, store, office, factory and farm are quite different. Also, much progress has been made in the improvement of the equipment through which electricity is used. It is all new today—the market and the service—from this standpoint of its application and value to the consumer.

Men and women have possessed shoes for thousands of years, but the shoe industry never falters. Styles change and continually re-create the market. But styles change because people change. And the same forces have re-created the market for electric light, heat and power, in all its applications. There is no obstacle to selling today, where the men of the electrical industry understand these changes and are in attune with the new conditions.

If the presidents and general managers and sales managers in the power companies are in earnest in their expressed desire to build back the load that hard times have lost them, it can be done. Their sincerity is not questioned. But merely talking about it or just driving harder in the old way will not accomplish much. It calls for a program of market development—highly organized and liberally financed—and changed to suit the times. And such a program will pay.

Radio waves for grounding data

CORRELATION of soil conductivity with the propagation of electric waves was a task undertaken by the National Physical Laboratory (British) during 1932, according to the annual report just issued. The results at once suggest that a converse approach by power engineers in this country might disclose facts of great value to utilities more and more skeptical of empirical practices of grounding as a protective measure. The British research found that high soil conductivity is conducive to greater distance of effective field strength range because energy loss in ground eddy currents is minimized, and conversely. It was also found that dried soil of inherently poor conductivity characteristics could be improved 1,000 times under normal earth conditions of moisture.

Immediately the thought arises that, if the radio engineers can find out something about wave propagation by studying soil conditions, the power engineers might well find out something about soil conditions along line routes by scrutiny of radio wave field data. The mass of data already accumulated by the broadcasting, signal corps and communication agencies should be a fruitful point of departure. Undoubtedly the correlation and interpretation of these data would prompt a more intensive study of the inductive and condensive properties of earth paths and show why blind reliance on mere localized conductance measurements often fails to afford the expected and desired ground protection. Anyway, with clouds many square miles in area discharging high-frequency impulses, why should a d.c. ohmic measurement over an acre or less be expected to tell the whole intricate story?

Engineers Prepare for

Edgewater Beach Hotel, where A.I.E.E. sessions were held

CHICAGO, in 1893 the scene of a momentous gathering of electrical engineers who laid the foundations for advance in the electrical arts, was last week again the Mecca for engineers. All the major engineering societies held conventions, and as a consequence Chicago's hostelries had a flavor that matched the dominant characteristics of the city's Century of Progress Exposition—science, invention, technology and engineering.

Joint meetings of the several groups were held on such overlapping zones of interest as the St. Lawrence power development, water hammer, econometry and engineering. Within the province of the A.I.E.E. the sessions were devoted largely to protection, machinery, measurements, dielectrics, hydro and steam generation and research. Relatively few strictly new devices were described, but the techniques of analysis were advanced along several fronts in the week's papers.

A new compression type low-voltage air circuit breaker, an energy loss meter and a new portable oscillograph were the major items of new apparatus. New techniques of test and research were exemplified in the fields of dielectrics, instrument spring fabrication, accelerated aging of cables and detection of their deterioration incurred in routine service.

New Cable Tests Advance Performance

Transmission and distribution engineers in large numbers heard, at the Thursday session, two papers confirming the fiber tube protector for insulator strings and four reporting progress in narrowing the unexplored region surrounding cables and dielectrics. In fact, the papers were commended by D. M. Simons as some that will be referred to frequently because they provide working tools for the elimination of residual uncertainties in cable performance. At least, said G. B. Shanklin, the ionization problem is now a minor one; the real problem is control of the oxidation which results in acids and soaps and also the formation of waxes.

There is also the matter of penetration, viscosity and capillarity of the oils to be correlated as Professor Whitehead has started to do in accounting for the variations in service life. Some lack of confirmation was expressed for his reliance upon penetrability of cable oils as being excellent indexes of oil quality. W. A. DelMar found that mixing heavy (cylinder) and light (transformer) oils to get graduated viscosity gave an abrupt change in breakdown voltage instead of the gradual transition conforming to Whitehead's theory.

Methods for rapid and accurate determination of power factor and hydrophil determination for total oxidation products, as proposed by Messrs. Wyatt, Spring and Fellowes (see ELECTRICAL WORLD, July 1, 1933, page 22) were highly commended. The lack of correlation between wax formation with indications of higher power factor at other points than conductor and sheath was associated by Professor Migudich with the equilibrium stages in the transition from oil to cable wax. The crystalline type of wax formed from the oil disappears when the stress is removed; likewise, the amorphous type changes readily to crystalline and vice versa, but pin-hole X-ray studies of diffraction patterns show that the characteristic cable wax is stable and a joint result of heat and electrical stress. W. A. DelMar has found that consideration of thermal resistances

points to higher power factor, as found by the Detroit Edison engineers to exist some 30 tape layers out from the conductor.

In connection with raising the oil pressures to get higher strength, Herman Halperin and others cautioned against the sacrifice in margin of safety that is made to get higher 60-cycle strength because higher oil pressure seems not to raise the impulse strength at all. D. W. Roper deplored the upward trend of prices for oil reservoirs and said that this and the necessary derating of contiguous cables to get the full economic benefits of oil-filled cable pointed to the desirability of pressing the research for cheaper cables of the solid type.

Known by different names but essentially the same in principle of action, the fiber tube protective gap is coming into rapid acceptance (see ELECTRICAL WORLD, June 24, 1933, page 820). So good has been the results of studies and trials on the American Gas & Electric Company system that the 65-mile, 132-kv. line from Roanoke to Glen Lyn is being equipped with the expulsion type of protector tube throughout. Philip Sporn advised, however, that three methods of installation of these tubes (parallel to the insulator string, at an outward angle at each end of the string, and obliquely directed from the tower to the conductor) are to be tried to see what is going to prove the best. He cautioned against losing all the advantages of added protection by introducing new hazards through the cluttering up of the pole top with poorly co-ordinated supports for the protective gaps.

Power Generation and Communication

Probably the conflict between available time and the urge to discuss was never more apparent in any Institute meeting than at the session on "Communication and Power Generation." The paper by G. G. Post on the Port Washington station of the Milwaukee Power & Light Company with its statements in favor of the bin system of pulverized fuel as against the unit type of air preheaters preferred against economizers and of other design decisions on moot points was flung at the feet of champions who were waiting for the challenge and eager for it. But the clock ticked on, the program was full and the chairman of the meeting, with honest regret in his eyes and words, was forced to announce that most of the promised discussion could be presented only in the transactions.

However, M. D. Engle, Boston; Professor Christie, Johns Hopkins, and F. H. Hollister, Sargent & Lundy, were permitted to have their say. From these discussions one got the idea that the tandem high- and low-pressure turbine arrangement at Port Washington was not unanimously preferred over the cross-compound double generator style; that the large furnace of slow heat liberation installed there would not be chosen by all other engineers; that the switching, if designed by others, might not have been isolated phase indoor construction, but possibly would have been metal-clad outdoor type or something different.

An instance of how the scientist and the engineers march ahead of the world was strikingly given in the paper on "Carrier in Cable," by A. B. Clark and B. W. Kendall. Nine communication channels 850 miles long carried on a 68-pair underground cable only 25 miles in length demonstrated that the capacity of telephone circuits has yet hardly been reached. This development, not yet made necessary for general application by commercial demands, constitutes a research reserve which can easily be tapped when the need for it arises. A particular virtue of the new development, as pointed out by Dr. F. B. Jewett, is its promise of complete flexibility of telephone plant for all kinds of commercial service—no more special dispositions for this or the other requirement of communication service.

Relays and Breakers Improved

Relays, circuit breakers and technical features of system protection dominated the session devoted to protective devices. E. E. George advocated staged tests on a system as a necessary means to insure reliability of relay operation. He outlined the tests to be made and pointed out that deferred maintenance in relaying would result in a deterioration of service standards. In his opinion tests should duplicate abnormal operating conditions and they may be made at nominal expense. H. P. Sleeper discussed the relaying of interconnections and pointed out that the many systems available pointed to the need for greater standardization. He also stated the economics varied over wide limits for the several systems. In his opinion static stability system limits should fix relaying requirements. He discussed the several types of relaying available and pointed out their limitation. In his opinion the ideal relay scheme should:

1. Be inherently selective.
2. Operate within 2 cycles.
3. Operate at both ends of a system link simultaneously.
4. Be unaffected by swings up to stability limits.
5. Protect against both circuit and ground faults.

He suggested the development of the pilot-wire system as the best solution. O. C. Traver agreed with the necessity for prompt action in clearing faults and declared that the time elements stated by Mr. Sleeper and his other requirements could be met and even surpassed, but that economics was the dominating influence. R. M. Spurck also agreed that the speeds could be obtained, but at a price. In the opinion of H. D. Braley it is doubtful if even pilot-wire relaying will answer all problems of interconnection relaying. It is necessary and advisable to fix the point on the system for interruption and it is necessary to consider and control the physical location of the system neutral point.

E. H. Bancker and E. M. Hunter stated that pilot-wire protection necessitated a consideration of the cost and

type of back-up protection and of installation and maintenance of pilot-wire protection. The cost of substitute relaying, however, has now approached that of pilot wires and this last method appeared most promising. R. M. Spurck presented a paper on tests for circuit breakers and discussed each test. Cathode-ray oscillographic studies of arc extinction by R. C. Van Sickle and W. E. Berkey indicated that consideration must be given to the time interval just before as well as just after zero current as the phenomena of arc extinction is not an abrupt transition from a conductor to a dielectric in the arc space.

Interest was shown in a new low-voltage breaker presented by D. C. Prince. The principle used is to inclose the arc in a metal barrel and to use the internal pressure generated by the arc to extinguish it. The arc extinction thus depends upon rate of rise of pressure. The breaker is semi-experimental for both d.c. and a.c. circuits. A supplementary spring mechanism is used to open the breaker on fault currents. A committee survey of the use of arresters was presented. The general opinion favored the use of arresters. Present troubles from arresters come chiefly from moisture. No conclusive data or opinions were given on co-ordinated insulation. Dr. Joseph Slepian discussed the paper of Mr. Prince and agreed with the principle of arc voltage drop with pressure. The length of the arc, however, is not affected by circuit inductance values—only the time element. Philip Sporn and several others also discussed the papers.

New Measurement Techniques Proposed

Refinement and versatility were the aspects most actively discussed in the group of measurement and instrument papers at Tuesday's session. Improved methods of forming and heat treating the coiled springs for electrical instruments brought forth the comment to the effect that only recently has there been a disposition to discuss the enhanced accuracy attainable by better springs; the reason has been that progress in other elements of design (coil forming, pivots, magnets, etc.) has advanced to the point where the residual effects of aging and hysteresis need attention.

Prof. C. M. Jansky said that what the author (R. W. Carson) had found out in his research on springs and reported in the paper would have averted for him many months' arduous experimentation years ago at the Bureau of Standards. He said the method of accelerated aging devised by Mr. Carson afforded the equivalent of the twenty-year aging of the spring chosen at the bureau for the dynamometer then being designed. A. E. Knowlton suggested that the recently evolved metallurgical theory of crystal oxidation as cited to account for fatigue in metals might well account for some of the zero drift and creep of instrument springs. The author did not feel that the effect could be of magnitude comparable to the residuals upon which he had concentrated.

New in design and service ability was the portable oscillograph described by K. A. Oplinger (see abstract of paper in ELECTRICAL WORLD, July 1, 1933, page 16). E. S. Lee of General Electric Company gave an interesting résumé of the evolution of the oscillograph and paid tribute to Messrs. Robinson and Legge, who supplemented the contributions of Blondel, Duddell and Dufour. For the cathode-ray oscillograph he prophesied the elimination of the vacuum pump and therefore a greater freedom of portability. He also pointed out that the photo-electric recorder was giving a non-photographic substitute for many uses of the oscillograph.

Compensating meter limited in applicability

Those who discussed G. B. Schleicher's compensating meter for measuring transformer losses on the low-tension side tended to add several items to the list of limitations as acknowledged by the author in his paper (abstracted in ELECTRICAL WORLD, July 1, 1933, page 27). Thus, W. H. Pratt of General Electric Company pointed out that the meter was limited to application to a transformer bank serving only one customer, and seriously questioned the savings claimed if proper recognition be given to the preparatory calibration based on particular transformer characteristics, etc. Stanley Green of Duncan Electric Manufacturing Company said there was a place for the compensating meter for long-duration light loads, especially those below 5 per cent of the watt-hour meter rating. It was his feeling that the Schleicher meter would be restricted to high-tension loss metering for statistical purposes. Paul MacGahan of Westinghouse concurred in this.

A. Boyajian of General Electric said there were relatively few transformers devoted to only one customer, that the method was not applicable to multi-winding or tap-changing transformers and that the higher the voltage and power rating of the transformer (thus offering the largest advantages through elimination of expensive high-tension instrument transformers) the higher the efficiency and the lower the transformer losses. To him the method appeared to have "tailor-made" characteristics that would entail unduly high engineering overheads.

In rejoinder Mr. Schleicher said that so far the Philadelphia Electric Company had confined the use to cases where outdoor high-tension metering would have involved great cost. He believed the cost of testing would be modest. He has found it economical to install on voltages as low as 2,300 and has effected savings of $5,000 to $6,000 on a 66-kv. metering installation.

Dr. Harvey Fletcher reported for the committee on noise measurements that two zeros of reference intensity levels were being recommended, one being a noise energy level equal to 10^{-16} watts per square centimeter, the other a pressure level of 0.002 bars. A dual standard for intensity-level comparisons is also proposed, one being the use of the decibel above the established reference level and the other the common logarithm of the pressure ratios. Rules are also being proposed for the technique of the observer in making noise determinations.

Electrical Machinery and Welding

Suggestion that the expressions "surge absorber" and "lightning arrester" be abandoned in favor of more exactly descriptive terms (since the first does not absorb surges and the second does not arrest lightning) was made by D. W. Roper in discussion of the Palueff and Hagenguth paper on "The Effect of Transient Voltage Protective Devices on Stresses in Power Transformers." The paper dwelt largely on the use of devices for modifying the shapes of traveling waves as a means of reducing insulation stresses in transformers and the conclusion of its authors was that the ability of the lighting arrester to reduce the amplitude of such waves was

a more effective means of protection. To this conclusion the classic antagonists of Palueff and Hagenguth in the long argument on how to protect transformers from lighting agreed and stated themselves happy to be for once in accord.

Two papers on mercury-arc rectifiers, one describing particularly the Westinghouse idea of sectional unit construction and the other giving data on a.c. and d.c. wave shapes on values of harmonics, started a discussion between the protagonists of the single and multiple unit schools. However, C. R. Hellmund found opportunity to present some ideas on the possibility of use of the mercury-arc rectifier for small applications that now are served by the hot-cathode electronic tube. These possibilities are opening out as research finds methods to reduce the arc voltage in the mercury rectifier. We may yet see mercury-arc rectifiers in radio sets and quite probably they will make their appearance in small sizes in control equipment, it was stated.

Electrophysics with a Practical Slant

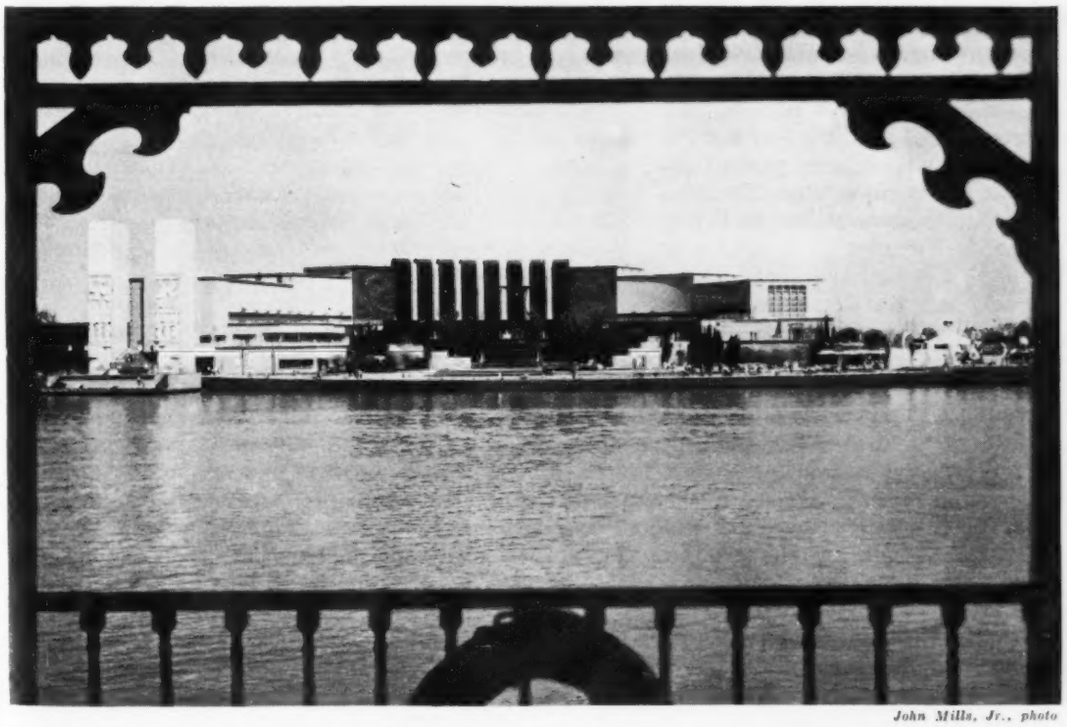
Although the five papers on the electrophysics committee's program dealt primarily with mathematical and experimental research, each paper had an immediate practical import. Thus the broad assumption that symmetrically disposed coils in multi-winding transformers could be expected to show similar regulation and short-circuit characteristics was shown by A. Boyajian to be unjustified. Unequal division of impedance drops in unsymmetrically connected windings (e.g., zigzag with one clockwise and the other counter-clockwise) is traceable to the different phase angle between the self- and mutual-load impedance arising out of the cross-connection between phases.

Phenomena in high-voltage sparkovers and low-voltage arcs during the initiatory microseconds were disclosed in papers presented by C. E. Magnusson and by Messrs. Dow, Atwood and Timoshenko, the former employing the Lichtenberg figure technique and the latter the probe procedure. The arc paper established the fact that nearly all the drop in the arc exists at the cathode.

Theoretical analysis of primary networks, reported by F. M. Starr, lead to the conclusion that the loss of a transmission feeder in a large network need never impose an excessive overload on any transformer. Another conclusion is that any effect which tends to improve load division under any emergency operating conditions will also tend to limit circulating currents under the same conditions. Bus regulation alone, however, without compensation does not improve load division. For networks subject to unbalanced loading the resistance adjustment of the compensator should be somewhat smaller when the ties are overhead lines than when they are cables.

M. S. Schneider of Cincinnati, in discussion, cited instances in which difficulties had been created by the phase displacement between different sources of supply to a secondary network. Setting the compensator R and X in the same 1 to 10 proportion as in the primary feeders made hardly any improvement. Nor did assumption of the load center as in the middle of the transformer help very much. But increasing R and decreasing X allowed the kw. load to govern the voltage regulation and load division.

The efficacy of panel heating or cooling as a means of establishing comfort conditions in room air was a matter on which General Electric and Westinghouse engineers seemed not to be in accord. Messrs. Teare and Levine of Schenectady, in discussing the paper by L. W. Schad of East Pittsburgh, were doubtful of the comfort criteria set up by Mr. Schad. They asserted that the higher the air temperature the lower the wall temperature required to establish that particular balance between radiation, conduction and convection which will bring conditions within the comfort zone. If the reversed refrigeration cycle is employed to cool the walls the major part of the saving should, in their opinion, be credited to the heat pump and not to the panel heating. R. E. Hellmund, in discussion, advocated the use of watts in conjunction with B.t.u. as a unit in which to express the heat quantities involved in air-conditioning problems. Thus the heat dissipation of a normally active human body might be stated to be about 117 watts as well as 400 B.t.u.



John Mills, Jr., photo

Electricity Building at Chicago's Fair framed by the ornate deck structure of the old Mississippi showboat

Engineers Must Now Turn from Economy to Economics

THAT the time has come for the engineer to assume the social responsibility consequent upon his work and to act on it has occupied the minds of many thoughtful engineers for some time past. This concept has now emerged as an imperative requirement on the entire engineering profession following its comprehensive statement in the series of presentations and discussions at the joint meetings of the A.I.E.E., A.S.M.E., A.S.T.M. and the Econometric Society which the future may prove to have been the most significant feature of Engineering Week during Chicago's 1933 World's Fair.

Although they were not so arranged in the program, the addresses and discussions of these meetings must have fallen into a coherent pattern in the minds of the listeners. First, the responsibility of the engineers for the social problems he has created (F. B. Jewett, "Some Fundamental Problems of the Engineer"); second, the present urgency of circumstances in the world scene that calls upon the scientist and engineer for action (A. P. M. Fleming, "The Internationalization of Scientific Knowledge as a Factor in World Economic Recovery"); third, advice to the engineer on how he should tackle the job which is before him (D. S. Kimball, "The Engineering Economist of the Future"), and, fourth, the application so far of the engineering method to economic problems (C. F. Roos, "Contributions of the Mathematician to Economics," and T. C. Fry, "The Mathematical Theory of Rational Inference").

Up to the present time, said Dr. Jewett, the engineer has been occupied with production, has been busy with his job of turning the discoveries of science into practical means of better living for man. He has had no time for, indeed in large degree has had no interest in, anything more than the immediate job. He looked no further than to the accomplishment of his work in the physical sense, did not see that this was not the end, was, in fact, merely the erection of conditions of a social problem for which he must assume a large part of the responsibility for solution. The engineer made the modern world; now it is up to him to show us how to live in it. There is need for the development of a system of social and political controls to handle the problems raised by advances in science and engineering, suggests Dr. Jewett. At present, new things are first perceived by the fundamental scientists, then the engineer takes hold of them, next the manager of industry applies them, next the economist recognizes them, now the public appreciates them and, last, they are taken into account by the law. This order of perception and understanding of new things is logical, but it is terribly slow, and to this slowness may be laid the blame for the social and economic disturbances that follow on the introduction of new things.

There is need for means by which the advance of science and engineering can quickly be brought into the understanding of intelligent people in all walks of life, so that whatever change such advances make necessary in political economy, in social custom and in law may be accomplished rationally and deliberately. The problem of education is now to inculcate a social consciousness in the engineer; it is also to lay a ground work of engineering understanding in the minds of the lawyer, the business man, the economist and other non-engineers. But the responsibility on the engineer to teach the people how to live in the world he has made for them is greater than on the people to learn.

There are three things to consider in the development of a rational world economy, said A. P. M. Fleming: The first is the evolution of international commercial and industrial relations. A visitor from Mars would be dumfounded at the spectacle of a world overflowing with the products of nature and of industry, yet in which people starve and go without. He would not understand, would not admit the validity of, the reasons why plenty, since it exists, is not enjoyed. Trade barriers that prevent national interchange of goods and commodities, difficulties of exchange, would mean nothing to him. He would not see why, since genius in art, music and science knows no nationalism, there should be economic boundaries separating one country from another to the harm of all.

The second point developed by Mr. Fleming was the relation of science and industry to employment. The function of industry is to develop and apply the gifts of nature both nationally and internationally. Even though it is desired to do so, it is impossible to confine industrial development within national boundaries if the natural conditions of particular development exist also in other nations. The greatest part of industrial research is devoted to the improvement of processes—that is, increasing their efficiency—of which the end result is always reduction of labor, and this is rapidly becoming only another way of saying unemployment. This condition could be changed by layinig the emphasis in industrial research on the development of new products, non-competitive with present ones for which desire would create the market. The pooling of scientific knowledge would provide opportunity for many more minds than now to work on this problem.

The United Socialist Soviet Republic of Russia (U.S.S.R.) constitutes a challenge to the capitalistic world that cannot be ignored. One may brush aside as failures Russian attempts to realize a planned national economy in terms of five-year plans and the like, but this is not evidence that the socialized state will not succeed eventually, as it well may do, said Mr. Fleming. If it does succeed it will have tremendous effect on the social and economic structure of the rest of the world. Russia includes 200 nations totaling 162,000,000 people and covers an area of the earth in which practically all natural resources are found. If, in spite of the diversity of nationalistic feelings included in the component governments of the Soviet Union, Russia does demonstrate that these nationalisms do not necessarily beget trade barriers nor prevent different peoples from amicable

existence together in a planned economy, then there will be forced changes in the nations of the Western World to realize the same benefits for their peoples. The best insurance of capitalistic countries against the possibility of the world-wide rise of the socialistic state is the pooling of scientific knowledge and the free techniques derived therefrom.

One might sum up Mr. Fleming's address in this fashion: A planned international economy is shown to be necessary by the present chaos that prevents all peoples from full enjoyment of industrial and natural products that science and engineering have made so bountifully available. The way to such an economy lies through the pooling of scientific knowledge and of the developed techniques for applying it. If this rational course is not taken, there is strong possibility that the necessary end will be achieved by the method that now is being worked out in Russia.

With his gloomy prophecy that growth of population would soon—this in 1789—outrun the available food supply of the world, the reverend Malthus, stepping out of ecclesiastical affairs into economics, furnishes an excellent example of the kind of thing that must be avoided by the engineer who also ventures from his familiar field under the impression that he has been chosen to solve the problems of economics. This was the warning of D. S. Kimball, who said that the engineer who goes into economics must relinquish the privilege of dogmatism to which he has become accustomed by the handling of exactly determinable quantities in his profession. Exactness of quantity statement is impossible in economics and the engineer must put away his positiveness when he works through an economic problem and announces his solution of it.

The opinion of Dean Kimball did not win entire concurrence from Harvey N. Davis, who said that the equations of economics were set up in their classic and accepted form as of static factors, of conditions in equilibrium, whereas they are dynamic equations and should be so recognized. Perhaps the experience of the engineer in working with the quantities of physical dynamics gives him the right to attack the less ponderable dynamics of economics with a confidence that may appear to be dogmatism in the light of the fact that no one heretofore has ever even tried to find quantitative solutions to economic equations.

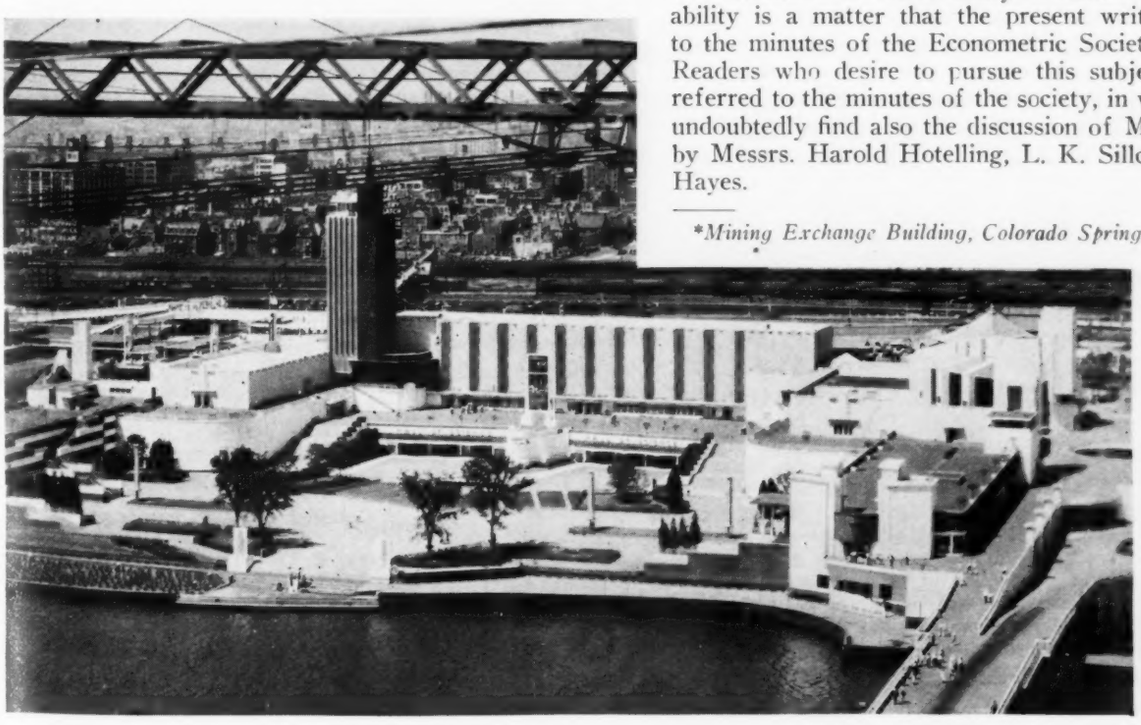
C. F. Hirshfeld sided more closely with Dean Kimball, saying that economics is only a science in the making, as were once the accepted sciences of today. Because of this condition, engineering is simple in comparison with economics and it behooves the engineer to step slowly and carefully when he walks out upon such an unmapped ground.

That present-day efforts to express mathematically the relationships of economic forces and factors bear promise of fruitfulness was the impression to be taken from the paper by C. F. Roos. In this paper was given the equation of price in terms of demand as worked out by Mr. Roos. That this equation of $P = fD$ contains as its kernel an expression in the form taken by the kernel of the hysteresis equation in electromagnetic theory and that both equations contain a factor of lag may be a significant evidence of validity for mathematical economics. But before equations in either engineering or economics can be solved there must be a quantitative determination of the factors entering into them.

This job is rather more difficult in economics than in engineering, it would appear from the presentation of the mathematical theory of rational inference by T. C. Fry. The conclusions apparent from statistics before being made into decisions for action in any specific case must be modified by common sense and by other information, said Mr. Fry. Also, prejudice is a factor which may require a greater or less amount of statistical evidence to overcome.

How common sense, previous information and prejudice are evaluated in numerical terms for combination with statistics to reach finally a definite ratio of probability is a matter that the present writer must leave to the minutes of the Econometric Society* for record. Readers who desire to pursue this subject farther are referred to the minutes of the society, in which they will undoubtedly find also the discussion of Mr. Fry's paper by Messrs. Harold Hotelling, L. K. Sillcox and Anson Hayes.

**Mining Exchange Building, Colorado Springs.*



As the passenger on the sky ride sees the Hall of Science at the Century of Progress Exposition

Problem of Power Supply for Resistance Welding*

By WARREN C. HUTCHINS

Industrial Engineering Department, General Electric Company

Resistance welding has been rapidly accepted by industry, especially for mass production. It has developed new and extremely difficult problems for the power companies. "Welding Loads Jump to Five Figures" is the title of a recent editorial in this magazine, in which the editor told of a flash-welding job being done in one minute, the power required totaling 11,000 kva.

Some of these welding loads are very unattractive to both consumers and power companies for the following reasons: (a) Intermittent quick changing load; (b) tremendous peak power demand; (c) single phase, unbalancing a polyphase system; (d) very low power factor (usually between 25 and 75 per cent), and (e) total energy consumption low.

Such loads are obviously objectionable to the power companies, and often the cost to the consumer of power with these unusual characteristics is so great as to prohibit the resistance-welding process. Usually the reason for such a high power cost is that the service lines already leading to the factory building, where the welder may be located, are too small to carry these large power demands and, as a result, it has often been necessary to install heavier lines and transformers. The investment cost of this apparatus is naturally high. For either large or small welding loads, a motor-generator set can be used to great advantage, for reducing the rate of kva. increase and decrease reflected on the power line, reducing the peak power demand and permitting use of existing shop lines, balancing the single-phase load on a polyphase line, improving the power factor of the load reflected on the power source and decreasing the welding current interrupted at the completion of weld.

Example of Flash Welding—One manufacturer had a flash-welding process which demanded power in accordance with the following:

Flashing Period	Up-Set
5 seconds at 150 kva.	1 second at 300 kva.
70 per cent P.F.	Approx. 40 per cent P.F.

Six of these welds were made each minute.

The following considerations made this an unattractive load: Single-phase load; 150 to 300 kva. intermittent operation; power factors ranging from 40 to 70 per cent; total energy consumption low, and rate of increase and decrease of load almost instantaneous, the peak load being interrupted by opening a contactor.

Space limitation prevents going into detail regarding these various items.

Motor-generator sets applied for this type of load have, in a number of cases, earned a net saving in power cost. Reasons for the savings are:

1. The investment charges and additional energy consumption due to the losses of the motor-generator set are more than compensated for by the elimination of the high penalty charges which are often necessarily imposed by the power companies.
2. Such arrangements, in all probability, will eliminate the need for additional power lines and transformers, permitting the use of the shop lines already in service.

*See ELECTRICAL WORLD, *December 31, 1932, page 881.*

Two methods were considered in coping with this situation: First, direct connection of the load to one phase of the power system, and, second, using a generator to furnish the single-phase welding power with a three-phase motor to drive the generator.

Cost Comparison—Direct connection to power system vs. use of motor-generator set.

From the data given, it is determined that the total energy consumption of the welder is 516 kw.-hr. per eight-hour day or a total of 129,000 kw.-hr. per year on the basis of a five-day week and a total of 250 working days. The methods for determining power rates vary so greatly from one section of the country to another that it will be necessary to make several logical assumptions.

Practically all power companies recognize the necessity for considering power factor in determining a billing factor. The billing factor multiplied by the base rate will determine the power cost per kilowatt-hour for a given load. Probably the method most widely used is as follows:

$$\text{Billing Factor} = \frac{\text{Base P.F. of rate}}{\text{Customer's P.F.}}$$

This billing factor is usually based on the peak demand condition, and for purpose of comparison this will be used.

The following will also be assumed: Base rate for power is 2 cents per kilowatt-hour, and base power factor of rate is 80 per cent. The welding load under consideration has a peak demand of 300 kva. at 40 per cent power factor. The billing factor is therefore $0.80 \div 0.40 = 2$. The base rate of 2 cents per kilowatt-hour multiplied by the billing factor of 2 equals 4 cents per kilowatt-hour, which is the rate per kilowatt-hour manufacturer must pay. Interest rate on all investments is assumed to be 6 per cent.

Assumptions with Separate Line and Transformers—The welding load is connected directly to a power system through a special 1-mile single-phase line with a transformer at each end so as to take power from a high capacity line. The cost of this apparatus installed is estimated to be $5,000.

For depreciation, repairs and maintenance on this apparatus, 12 per cent will be considered a fair value. For insurance and taxes, assume 2 per cent. The total fixed charges are therefore 20 per cent of the first cost.

Assumptions with Synchronous Driven Alternator—It will be possible to connect the motor load directly to the existing shop line. This is logical in that the load will be balanced on the three phases and the peak demand will not exceed 130 kw. at 80 per cent power factor leading. (See ELECTRICAL WORLD, December 31, 1932, page 881, for explanation of this value.) The losses of the motor-generator set will be conservatively estimated to be 20 kw. average; 20 kw. for 250 eight-hour days amounts to an annual consumption of 40,000 kw.-hr. The cost of a synchronous motor-driven alternator with control suitable for the job will be approximately $4,200. Fixed charges will be assumed 5 per cent greater than for line and transformers when load is connected directly, to take care of the probable increased maintenance and depreciation.

The net saving resulting from use of a motor-generator set was $1,730 or 28.1 per cent. This would pay for the motor-generator set and control in less than 2½ years.

Annual Cost Comparison

	Power Supplied Direct to Welder	Using a Motor-Generator Set
Power cost:		
129,000 kw.-hr. at 4 cents	5,160	
169,000 kw.-hr. at 2 cents		3,380
Power line and transformer cost fixed charges 20 per cent of $5,000	1,000	
Motor-generator set fixed charges 25 per cent of $4,200		1,050
	6,160	4,430

Taxation

By W. C. MULLENDORE*
Executive Vice-President Southern California Edison Company.

Destroying more purchasing power than can be re-created by government expenditure of money collected.

Preventing rate adjustments that would stimulate trade.

Working two ways to stifle taxable sources.

MOST of us are exhausted not only by the burden of taxation itself, but also by the burden of talk concerning it. We know that taxes have risen to their floodtide, while the tide of trade and production has been ebbing. We know that the portion of the national income taken for taxes has risen in a few years' time from one-tenth to one-third. We have been told that the national debt, public and private, has risen until it is almost, if not quite, equal to the national wealth. We have been told these startling facts so often that they have ceased to be startling and are only boring. Of course, taxes are breaking our backs, but our burdens and our crosses have been so weighty and so numerous of late that we even refuse to become excited by broken backs.

Nevertheless, as was said by George T. Buckingham in his splendid address on this subject at the National Electric Light Association convention in Atlantic City last year: "Instead of being an incident, taxes have become the most important and the most serious single fact in the affairs of every citizen." That being even more true today than it was one year ago, we must continue to try to do something about the tax problem.

Once upon a time, when the relations between government and citizen were of a simple character, it was comparatively easy for the citizen to see what he was receiving in exchange for his taxes, just as it was easier for the government to determine the citizen's ability to pay.

But times have changed, and as they have changed governments have assumed new duties and new functions—new bureaus, new boards, new departments, new commissions, and thousands of new agencies which furnish the citizen not only with protection but with attentions and cares undreamed of in the simpler days. With this change it has grown increasingly difficult for the taxpayer to determine what he receives of value from the myriad functions which the government performs, and increasingly difficult for governmental agents and agencies to levy taxes in proportion either to ability to pay or to benefits conferred. Of one fact we may be reasonably sure.

We are not receiving from government benefits which justify the taking of one-third of the national income, which means that we work, if we have work, 100 days out of each year to pay the expenses of government.

No citizen has a right to complain of just taxation. All citizens have both the right and the duty to complain of destructive taxation. The destructive effects of taxation generally arise from one or the other of two sources: Excessive taxation or discriminatory taxation. Both of these misuses of the power to tax result in depriving the taxpayer of more value than the tax collector receives. The electric utility industry is today suffering from both excessive and discriminatory taxation, but particularly from that discrimination which imposes burdens on this industry not borne by its competitors.

All taxation should be tested from the standpoint of the public interest. Let us apply that test to some of the taxation which is proposed and which is practiced today. The public as a whole is vitally interested in the maintenance and growth of purchasing power. Certainly many of the proposed remedies for the economic woes of the day have as their objective the revival and creation of a widespread public purchasing power. So important is this deemed that new tax levies are proposed for the purpose of providing money with which to create purchasing power. What then shall be said of taxes which are so devised as to destroy much more widely diffused purchasing power already in existence than can be recreated by the expenditure by government of the tax money so raised?

Destroying purchasing power and invested savings

First, taxes are reducing, and in many cases actually are stopping, dividend and interest payments. These payments are owing to those who have bought equipment and plants with their savings. The interest and dividends are rental payments for that equipment. Too few people understand that big business as it exists today is merely the result of the pooling of the savings of millions of investors in modest circumstances, either through insurance and savings accounts or through direct stock holdings. As Mr. Hagenah recently pointed out before a committee of the United States Senate, the operating power companies of the United States are owned by 1,535,000 stockholders, 70,000 of whom are employees and 1,100,000 of whom are customers of the companies. Payments for the use of their money mean a widespread diffusion of purchasing power. Conversely, a diversion into the coffers of government of the earnings which should have gone to pay these people for the use of their savings means a widespread contraction of purchasing power. It means more than that. Inasmuch as values are dependent upon earning power, the disappearance of net earnings means widespread destruction of values. For example, the proposed imposition of a 3 per cent tax upon the gross earnings of the electric utilities by the federal government would divert that proportion of the

**Excerpts from paper presented before first annual convention of Edison Electric Institute, Chicago.*

earnings of these utilities which are required to support the value of money invested.

Thus, while the federal government might derive $25,000,000 of revenue, the destruction in value of savings invested in utility equipment would amount to several times $25,000,000. Again, the taxpayer would be deprived of many times the value which the tax collector received, and if the money so diverted into the public treasury is spent on a non-productive undertaking, the loss to the public is increased manyfold by diverting capital from productive to non-productive uses.

These taxes which stop interest and dividend payments are merely examples of taxation which designedly or otherwise result in "capital levies." A capital levy, whether frankly imposed for the purpose of redistributing wealth or whether imposed through ignorance of its real effect, results when the owners of real estate, manufacturing plants and of other real and personal property are taxed beyond the earning power of that property, so that the only way in which the tax bill can be met is by turning over a part of the thing itself to the tax collector, or by attempting to sell all or a part for cash with which to pay the tax bill. Most physical property is wealth only as it is in use, and it cannot be taken apart and divided up among worthy constituents of tax-levying bodies without destroying its value. That which is often attempted is the sale of the property for cash. But when there are many taxpayers attempting to sell in the same market, we find a dearth of cash purchasers and a glutted market, in which values are but a fraction of what they should be.

Thus, the taxpayer is deprived of great value and the state receives but little. Something of this process has been going on in more than one city and state of the United States. That it has resulted in the more equitable distribution of wealth is questionable, but that it has resulted in the destruction of enormous capital values is unquestionable. All should be able to agree that taxation having such results is not in the public interest.

Preventing rate reductions and resulting trade stimulus

Another glaring example of taxation destroying more wealth than is received by the public treasury is to be found in those taxes which prevent the reduction of rates to millions of users of public utility services. Lower rates encourage increased use and increased use means more production—a growth of goods available for exchange, which means a growth of purchasing power. Denial and postponement of rate decreases caused by government taking that which should have been available for consumers again results in the destruction of more purchasing power than can possibly result from the expenditure by the government of the sum so collected. That the electric utilities desire to and will make rate reductions voluntarily unless prevented by unduly high taxes is amply proved by their record. During the period of prosperity and even during the present period of rising taxes and declining revenues, numerous rate reductions have been granted voluntarily by companies operating in all sections of the country.

As an example, I cite the case of the company with whose activity I am most familiar. In the past nine years that company made eight major voluntary rate reductions, and during a period when other living costs were rising the domestic lighting rate within its territory was reduced by 50 per cent. Likewise, generally throughout the country the electric bill trend has been downward, while living costs were rising, and the electric bill today remains well below average living costs. These electric utilities did not seek to and were not permitted to participate in the profits of prosperity, and as a consequence they have no large cash reserves upon which to draw for operating losses during the period of depression. A discriminatory tax rate which constantly threatens to force upon the hundreds of thousands of owners of these utilities an operating loss, with a consequent denial of any return, is neither fair nor conducive to national recovery.

Still another example of the use of the taxing power which results in wealth or value destruction rather than in its preservation or creation is to be found in the levying of tax tribute upon an existing industry in order to obtain capital with which to build a governmentally operated and tax-exempt competitive enterprise.

That the value of capital already invested in existing plants and equipment should be destroyed by unfair governmental competition and that business owned and operated by taxpayers should be compelled to furnish the ammunition for its own destruction through tax contributions for the construction and operation of governmentally operated competing enterprises is a gross abuse and misuse of the power of taxation.

Yet for years the railroads and other business enterprises of the United States have suffered from this use of the power of taxation, and today we have more than one example of its use against the electric utilities.

Closely allied with this affirmative use of the taxing power in value destruction is the negative use of the same power by failing to use it in the taxation of proprietary governmental enterprises which operate side by side with privately financed taxpaying enterprises. The differential in operating costs which the government thus creates for its own creatures destroys values and threatens the existence of the sources of taxable wealth. This discrimination in the imposition of tax burdens has not been and can never be justified on logical grounds. The proprietary enterprise which is financed by the use of public credit is given a great advantage over its privately financed competitor in the use of that public credit. Why, then, the further enormous advantage of freedom from a tax burden?

On privately financed electric utilities in many states of the Union today the tax burden takes from 13 to 17 per cent of the gross receipts. No industry can stand such discriminatory treatment. Not only is such treatment unjust and unfair; it results in deceptive and misleading statements as to the relative performance of publicly and privately financed utilities, and it immeasurably retards and threatens the improvement of essential public services. There is today great public concern because of threatened impairment of railroad service and loss to railroad investors, and powers of government now are being utilized in an endeavor to prevent threatened injuries to railroad owners and users, which threats have much of their origin in discriminatory burdens imposed by government in the past. Is it too much to hope that we can profit by this experience?

These problems are typical of many others which arise out of and are created by excessive and discriminatory taxation from which our industry is suffering. The list is inexhaustible because new angles to these problems arise daily. The principal question before us as managers and employees of these public service companies is: What shall we do about it?

For at least three years the public as a whole has become increasingly tax-conscious. Taxpayers' leagues and associations, tax-reduction clubs, chambers of commerce, realty associations and thousands of other agencies have been crying loudly for reduction of the tax burden. Every candidate for office has had as the first plank in his platform the reduction of taxes. There has been no lack of effort in tax reduction, and in some localities progress has been made.

Taxes approach 50 per cent of net income

Yet we of the electric utility industry find that the tax burden on the owners and users of our service is greater than ever before. From a gross income of $1,833,000,000 in the calendar year 1932 the electric light and power industry paid approximately $225,000,000 in taxes, or an average of 12.27 per cent of its gross income, and something approaching 50 per cent of its net income. The portion of gross taken by taxes increased in one year by at least 2 per cent, or from 10.2 to 12.2 per cent. In some companies, as I have before pointed out, the proportion of gross taken has risen as high as 17 or 18 per cent. This increase in total sum of taxes paid has of course taken place during a period when earnings were declining.

Some three years ago a great deal of public attention was attracted by a statement made by one of our prominent ambassadors criticising the fact that the cost to the user of electricity was so many times the cost of its production or manufacture, and he called attention to the fact that electrical energy from the most modern and efficient plants was produced at a cost of from 3 to 4 mills per kilowatt-hour, and he criticised the fact that it was sold to the ultimate domestic consumer at a price several times this cost at the plant. He failed to take into account the fact that the principal costs of electric service are incurred after the electricity leaves the manufacturing plant. Nevertheless, those who are impressed by his statement should also be interested in the fact that

the tax burden alone per kilowatt-hour is today approaching the cost of its manufacture.

The cost of the raw material—fuel or falling water and labor—is no greater than the tax per kilowatt-hour. As an example, the tax burden per kilowatt-hour on one of the large companies with whose costs I am familiar was, in 1925, 1.26 mills. But in 1933 the tax burden promises to be not less than 2 mills. There are but few taxpayers (the gasoline and cigarette manufacturers excepted) who are paying more taxes per unit of product than the cost of their product at the manufacturing plant.

Why this unusual burden upon a commodity and service which is in such common use? Is it to be explained in part by the feeling that the electric utility is an easy goose to pick? Perhaps it is in part to be explained by a remark attributed to one of our national legislators: "While it is true that the power companies are in many instances paying unjust and discriminatory taxes, and while we who have studied the problem know it and you who are operating the companies know it, the difficulty from the standpoint of those who have the responsibility of levying the taxes is that the public generally does not know it. We are compelled to take into consideration what the voter thinks the facts are, even though the facts may be somewhat different."

Public unaware it is jeopardizing own interests

The tendency on the part of the public is to visualize a power company as a small group of wealthy individuals who are simply selling a service to the public and who are chiefly interested in profits. There are those who find it helpful to cultivate this picture of the power companies as a means of advancing their theories as to public policy in the power industry. We as managers in this industry have repeatedly endeavored to explain that as managers of these properties we are acting as trustees for the people who use the service and for that large section of the public whose savings are invested in the enterprise. In our endeavor to make the true situation clear to the public, we have not met with any large measure of success; in part because of the endeavor of those whose purpose it serves to create the opposite impression and in part because the modern relationship between large industry and the public is of such recent development that the true situation has not yet been brought home to the public.

It is even difficult for many of our stockholders and bondholders to appreciate their responsibility in protesting the unfair treatment of our industry. Many of these real owners look upon themselves as investors only, rather than as partners in a joint enterprise. It is even more difficult to bring home to the consumer the realization that he is jeopardizing his own interests when he joins in movements to burden the companies unduly.

Notwithstanding these difficulties, it is our job as managers of these properties and as trustees for the public which depends upon these properties for a vital and essential service in its daily domestic and business life to protect these properties against unfair and confiscatory taxation. In this new day which is developing there seems to be a growing appreciation of the interdependence of all business. Indeed, it is now being realized that most business enterprises partake of the nature of a public utility, and they are being subjected to regulation and control which is designed to protect the interests of the public in the service which business performs. Hence we may hope that in this period of readjustment the owners and users of these joint enterprises will come rapidly to a more complete realization of their responsibility, and will assist in endeavoring to impress upon those who wield the taxing power that it is the public interest which is jeopardized by an unfair exercise of that power. At least we will not have done our full duty until we have informed the owners and users of these properties of the threat which exists in a discriminatory tax. These people whose interests are at stake in the public-service enterprises which we manage are the same people who are represented by those responsible for the imposition of discriminatory tax. They are entitled to receive the facts from us. If we do not advise those for whom we are trustees of the facts we will be derelict in our duty. If, after they have the facts, they take no action to protect themselves, at least our responsibility will be less.

Gear Your Advertising to the Sales

Effective advertising is based on a knowledge of who is to be sold, how funds should be allotted and what appeals will stimulate load building and correlate the activities of other branches of the industry.

IN THE utility business today's problem is to build additional load in the most economical and rapid manner possible and at the same time to encourage and co-ordinate the efforts of allied organizations. Paramount in the utility sales development program are the methods employed in overcoming a tangible and stubborn sales resistance. In combating sales resistance advertising will be found a most valuable and versatile weapon, if properly used. However, it is its very versatility that makes misapplications common and impairs its value and efficiency.

Advertising can be employed effectively only if co-ordinated with the general sales program. Its use ranges from the lightning-fast, machine-gun attack on a definite objective to a continuous barrage which, by its very consistency and power, will break down mass sales resistance to the ever-growing convenience and economy of electrical applications. Carrying the analogy of ordnance still further, such a barrage represents that wide classification known as informative advertising and is designed to create an appreciation for electric service.

If successful, such a barrage enables the consolidation of new positions, from which the fire from lighter guns will be effective. The object of laying an advertising barrage is to overcome probably the greatest resistance in electrical sales development, that being the current impression that electricity is high in cost. Consumers still think in terms of fifteen years ago when the electric statement represented largely the cost of lighting. The monthly service bill is still referred to as the light bill, with little appreciation of the many services it performs in the home or the low unit cost of that service. Rates are generally understood by the consumer as the amount per kilowatt-hour indicated in the first block of the rate schedule. The customer's impression of all electrical appliances or of electrical service is rooted in that lack of understanding and misconception of operating costs. Before appliances or apparatus of any type can be sold in quantity at low sales costs this misconception must be corrected.

Suggested Allotment for Utility Advertising Funds

This budget is set up for a utility having a gross revenue of $4,000,000 annually

	Per Cent	Amount
Residential Service Advertising		
Newspapers	23	
Poster boards	5	
Displays	2	
Miscellaneous	4	
	34	$10,200
Rural, Commercial, Industrial Advertising		
Farm magazines	6	
Direct-by-mail	10	
	16	4,800
Merchandise Advertising		
Newspapers	26	
Radio	8	
Display	2	
Direct-by-mail	10	
	46	13,800
Cooking schools shows, demonstrations	4	1,200
	100	$30,000

Overcome the price complex

Informative advertising campaigns have been highly successful in accomplishing this. Some utilities have based the campaign on the services 1 cent's worth of electricity will perform. Others have attempted to point out that the monthly service bill is no longer a light bill by analyzing such bills and impressing the customer with the many services electricity performs during the month. Supplementary objectives of such campaigns are educational in nature and sell the economy, safety and adaptability of electricity.

The selection of media and types of copy is extremely important to the success of any campaign of informative advertising. To reduce the sales resistance of the general public, newspapers, billboards, displays, demonstrations, imprinted statements and the customer education through employees are effective. However, concentrations are necessary among general groups in the more specialized fields, such as the farm, the store, the office and the factory. Trade publications, farm magazines and direct mail are the most effective in that type of educational advertising. Of necessity such advertising must be selective in nature, dealing with the problems of a specialized group. Since to these consumers the use of electricity is more closely associated with the business of making a living the information must be technical and specialized in nature and deal largely with improved processes or applications made possible by the use of electric service. This field has more definite limitations than the larger residential group and should be given extra consideration if manufacturers and dealers are to promote the sale of converting devices at a profit.

With informative advertising preparing the way, refinements in the application of subsequent advertising are necessary for the close-range, intensive selling effort. Informative advertising will bring the sales promotional program within striking distance where intensive selling efforts will bear greatest results. The advertising campaign must be adapted to the new situation.

At this point the dealer and manufacturer become potential allies. With the utilities they, too, seek more business. Co-ordinated effort on the part of all three is necessary if each is to enjoy the maximum profit. Advertising must assume the additional burden of corre-

Program

By GLENN L. JACKSON*

Vice-President in Charge of Sales
California Oregon Power Company
Medford, Ore.

Samples of informative advertising which can be used as effectively on a standard billboard as on a sticker for the electric statement

lating the activities of these three aggressive organizations. In doing so it must become more selective and more intensive.

In advertising direct to the consumer all three employ practically the same methods. The utility may use direct mail, newspaper advertising, bill stickers, cooking schools, appliance exhibits and the radio. The manufacturer uses national consumer publications and direct mail to an advantage, while the dealer uses direct mail and local newspaper advertising. In selling the large and small power users direct-mail advertisements in trade journals and technical magazines play an important part.

The above are effective, close-range interest getters and each has a definite function in the sales program. In a field that is properly prepared by intelligent advertising salesmen may be expected to have a greater success and direct selling costs may be minimized.

From the utility standpoint it is necessary to allocate the sales budget among the above media in a manner that will produce maximum effectiveness. The budget on page 54 has been set up for a utility having a gross revenue of $4,000,000, together with the amounts and percentages to be expended for various types of advertising through the medium represented. While mediums may vary, due to local conditions, it is believed that this segregation of the advertising budget as shown will be applicable to the average utility and the suggested media are essential to the conduct of an effective promotional program.

The quality of advertising is of the utmost importance. Hit-and-miss, unrelated advertising, even though used in quantity and through all mediums, is expensive and ineffective. An advertising idea is necessary. That idea must have a definite customer appeal and should be carried as a key through all types of advertising. It may be the all-electric home, the electric kitchen, or what 1 cent will do in the operation of various appliances. Whatever it is, an idea is essential to good advertising. Special offers, prices and terms have been stressed too long. Such advertising is predicated on the thought that the public is already sold on electric service and the converting devices necessary for its use, that it is interested only in bargains and that the fellow who has the greatest bargain, whether it be furniture, automobiles, washing machines or wearing apparel, will get the business. Price of the appliance is the last step in our selling process. The big problem is to create desire, for the greater this desire is the less important the price becomes.

Many current trade problems may be traced directly to past merchandise advertising practices. The apparent theory that the public has been interested only in washing clothes in a dollar-down washing machine, cooking meals on a $2-a-week range and keeping the baby's food in a 24-months-to-pay refrigerator has bred turmoil in the ranks of the electrical industry. While it is true that price, down payment and terms have a place in the selling picture, they are by all odds secondary to the importance of selling the electrical idea. Such advertising, in addition to creating trade difficulties, contributes nothing toward the development of an electrical consciousness. Service received is our paramount appeal and is remembered or enjoyed long after the price has been forgotten.

In the past few months the pendulum of utility merchandise advertising has apparently swung in the opposite direction and is now regarded generally as dealer co-

**From the report of the advertising committee, sales section, Northwest Electric Light and Power Association, Portland, Ore.*

operative merchandise advertising. Prices, terms and down payment have been eliminated to a large extent and the copy has become more general in nature.

Essentials of co-operative advertising

So-called "dealer co-operative advertising" in many instances has been a waste of time and money, detracting from the sales punch of the utility advertisement and, at the same time, doing the dealer absolutely no good. Why advertise the exclusive features of a Blank electric range, with the signature on the bottom of the advertisement "See the Podunk Power Company or Your Dealer," when the utility knows and the dealer knows that the Blank line of electric ranges is sold only by the power company and can be purchased nowhere else in the community?

That, unfortunately, has not been the worst offense against good advertising practice. The punch of so-called dealer co-operative advertising has been pulled in an effort not to appear too aggressive and to give the dealer "a break," resulting in no return from the advertisement, needless expense and no benefit to either the dealer or the utility. Again, certain advertising, designed as appliance selling advertising, includes reference to a number of trade lines with a list of the dealers handling the appliance. At best, only one or two selling points can be put over in a fair-sized advertisement. These points must not only be put over but must be clinched, and the injection of any factor which raises doubt or confusion neutralizes the value of the advertisement.

The value of co-operative dealer advertising lies entirely in the promotional field and is not to be confused with strictly merchandise copy. The co-operative background must be built with educational cost data and promotional advertising, stressing the value of the service itself through newspapers, billboards, displays, demonstrations, imprinted electric statement and customer education through employees. By creating a background of public appreciation for electric service and the functions that converting devices perform, the dealer can advertise definite products with a maximum possibility of justifiable returns. If the retailing of electrical apparatus of any type is to become profitable and satisfactory to the dealer, public acceptance must be created. The public will accept merchandise advertising when it becomes sold on the idea that electricity is cheap, convenient, safe and that the service is easier to use and will perform the job more satisfactorily than any other method that could be employed. Then, and then only, will appliance advertising, either by the dealer or the utility, reach its full effectiveness.

Specialized promotional copy needed

There is evidence of a definite need for specialized promotional advertising on commercial lighting, commercial heating, industrial appliances and rural electrification which can be successfully merchandised by the dealer and manufacturer. Co-ordinated advertising by the dealer, manufacturer and utility would be a definite forward step. For instance, the all-electric home could be used as the key idea around which the advertising copy from these three branches of the industry could be built. The educational background necessary for the acceptance of the electrical home idea would be built up by the informative advertising of the utility. Individual items, making up the electrical home, could be advertised through this key by all manufacturers and retailers. All types of demonstration, display, shows, etc., could be tied in easily with such an idea, resulting in a unified sales promotional front to the advantage of all. Such a plan would correct many of our trade problems, reduce advertising costs by the elimination of waste copy, make possible profitable distribution and sale of converting devices and insure the maximum results in increased load to the utility company.

▼

Satisfactory Experience with 8-Kv. Aerial Cable

Beginning in February, 1931, the Central Hudson Gas & Electric Corporation developed an 8-kv. aerial star-connected cable system which now includes 106,000 ft. of single-phase cable, 45 per cent of which is operated at 4,600 volts and the remainder at lower voltages as dictated by system requirements. At a recent meeting of utility engineers in Boston G. H. Underhill, superintendent of distribution for the Central Hudson, stated that two major difficulties have been experienced and overcome. The first failure was the result of improper design and the second of improper cable construction. The original installations were made with so-called "performance rubber" cable, and shortly after their completion it was decided to use higher-grade special rubber compounds instead. This improvement, plus minor changes, increased the cost of cables so that at present single-phase No. 4 sole-owned rural lines cost complete from $2,600 to $2,800 per mile, including transformers, secondaries and services for an average of seven to eight customers per mile. For city work the only available costs are submerged in a large involved job and have not been segregated.

Mr. Underhill stated that no accidents have occurred; there have been no cases of improper fuse action or excessive damage to cable shielding under short-circuit conditions, and there have been no cases of radio interference. The cables have passed through two lightning seasons and two winters with only one interruption due to the elements, when a large tree fell and broke both messenger and cable. Interruptions from all sources, due principally to two shotgun punctures, have resulted in a per mile record of 0.37 for 1932, compared with an average of 0.42 for open-wire lines for a much larger period. Most of the city installations have been made along rear lot lines, many poles of which are festooned with 30 or more attachments. No difficulty has arisen.

Mr. Underhill said that he knew of no economically comparable scheme which provides the possibilities of high capacity, long life, adaptability to civic conditions, safety and low total annual costs which are inherent to the high-voltage common neutral aerial cable system. The 8-kv. service, as is well known, results from the star connecting of the 4,600-volt phases. In its complete form the system utilizes loop feeders of some 3,000-kva. capacity. The cable messenger wire serves as the common neutral for both primary and secondary circuits and the phases are formed by single-conductor, metallically shielded rubber or varnished cambric cables. No lightning arresters are used.

The Virginia Plan for Installment Financing

By EARL WHITEHORNE

A system based on a balanced co-operation between dealer, manufacturer, power company and bank, organized to provide a local service to promote residence load.

SOME time ago a study was made of the financial status of the some 100,000 residence consumers on the Virginia Electric Power Company system. It was recognized that the greatest opportunity for immediate growth lay in the development of domestic load. The question was how many homes were in position to buy electric refrigerators, ranges and water heaters and at what terms. Analysis showed that only about 5,000 families would be able to purchase such equipment for cash. About 5,000 more could be expected to buy if they could spread their payments over a year and a half. Some 12,000 more would probably respond to 24-month terms and about 8,000 more if smaller installments were spread over 30 months. This left a total of some 70,000 families that could only be sold on terms of $10 a month or less—a large proportion of which were out of the market entirely. This included the negro cabins, and others in humble circumstances that remove them from consideration.

Clearly, then, this matter of financing is a powerful factor in the marketplace today. The American people have generally accepted and adopted the principle that installment buying is sound practice. The old-time idea of thrift demanded that money be saved and accumulated before it was spent. But the present generation believes that it is more sensible to pay an additional percentage on the cost of the purchase for the privilege of enjoying the use of the appliance while the money is being saved. And it is one of the surprises of the past years of depression that installment contracts have been carried out. Losses have been extremely low, repossessions unbelievably few. True, they have been increasing in the last few months, but a fraction of 1 per cent has been the record of most well-managed installment financing companies. Easy payment terms, therefore, have become one of the major influences in modern marketing of household equipment.

An analysis of prevailing rates in installment financing discloses a wide range of practice among leading companies in the amount charged for partial-payment accommodation, when it is expressed in per cent per year based on diminishing balances. These figures are somewhat startling at first sight, but it must be remembered that they are calculated on the money which is actually on loan to the purchaser in the course of an installment contract month by month. When a price is quoted on an appliance the figure is ordinarily given as so much for cash and so much "on terms." In the term price a percentage of the initial unpaid balance is added to the total sales price.

As time passes, however, and successive payments are made the unpaid balance diminishes and the amount of money actually being loaned is reduced. But the interest is figured for the term of the contract on the initial amount, which means that the actual charge made for money owed, expressed in a percentage, is much higher than the rates quoted.

This may be necessary to compensate for the cost of collection and the service rendered, but it, nevertheless, constitutes a heavy percentage added to the cash price and a burden of actual cost for buying by installment payments. The figures are given in the accompanying table. They are closely approximate, but differences in details of financing plans do not permit of exactly comparable figures.

Cost of Partial-Payment Accommodation

Unpaid Balance — Cash price less down payment	$30		$50		$100	
Number of monthly installments...	6	12	6	12	6	12
	Per Cent					
Finance company No. 1.....	80	..	48	46	24	24
Finance company No. 2.....	80	..	48	52 G	24	24
Finance company No. 3.....	....	..	....	..	27	17
Finance company No. 4.....	....	..	....	..	24 A	20
Four department stores.....	10.4 B	..	10.4	11	10.4	11
Chain store practice.....	40 C	..	....	26 D	....	24 E

(A) Do not have six-month period. Figure covers a four-month period.
(B) Only one of the four stores handles this amount.
(C) With small remaining payment in the seventh month.
(D) Do not have six-month period. Figure covers a ten-month period.
(E) With small remaining payment in the thirteenth month.
(G) For thirteen-month period.

This difference in the charge made for financing the sale of a refrigerator or a range on easy payments naturally becomes a determining element in price, when it adds 15 per cent or more to the cost of a piece of merchandise. So the control and operation of installment credit takes its place as an important feature of modern merchandising. It was obvious, therefore, that the key to the development of residence load in this territory, under existing conditions, might well be found in the organizing of a more favorable service for financing household sales.

The company is now selling refrigerators, ranges and water heaters only—all of them items of sufficient size to be worth while both in terms of load and as a sale—at a charge of 6 per cent, financing the operation out of its own funds. This applies to Richmond, Petersburg, Norfolk, Portsmouth, Fredericksburg and the other communities of Virginia and North Carolina on the company's lines.

The dealer plays a major part in the planning of the Virginia Electric & Power Company. It is recognized that the flow of this household equipment into the homes

is becoming more and more a matter of orderly distribution through retail outlets supplying the various neighborhoods and strata of the market and the entire sales plan of the company is calculated to stimulate and develop this dealer distribution.

To this end, the company some time ago withdrew from the sale of small appliances, turning this business over to the dealers exclusively. Early in 1933 it discontinued selling refrigerators, and of 5,000 added to the load last year 4,400 refrigerators were sold by dealers. Out of 1,165 ranges sold, 374 were marketed by dealers. There has been a sustained effort, therefore, to promote the activity and effectiveness of the dealer and there is good evidence of the success of the methods used, in the fact that despite the bad times the average total kilowatt-hour consumption per residence customer increased on the system last year by 88, to a total of 702. This includes small and large rural customers, but not electrified farms with heavy loads outside the house. The national average was then 601.

There was need, however, for a financing plan to provide for the small dealer who was unable to secure installment credit service except at prohibitive prices or at too great a burden on his limited capital. The Morris Plan Bank of Virginia offered a service, based on its extensive experience in financing the credit needs of the individuals. This bank has branches in Richmond, Petersburg, Newport News, Norfolk and Roanoke. Out of this evolved what I am calling "The Virginia Plan for Installment Financing," developed in large part out of the enthusiastic interest of T. C. Boushall, president of the bank.

How the plan operates

The plan, in a word, establishes a co-operation between the purchaser of an appliance, the dealer, the manufacturer and the bank. It offers a service of installment credit on unpaid balances of $75 or over at a flat discount charge of 6 per cent per annum plus a 1 per cent fee or 12 per cent for two years' time plus a 2 per cent fee. It provides a balanced responsibility that insures a low price to the purchaser, because the risks and costs of operation are reduced to a minimum. The operation of the plan is simple and easily described in the following steps:

1. The purchaser of an electric range makes a minimum down payment of 10 per cent (or more if the customer desires) and signs an installment contract with the Morris Plan Bank, calling for payment over the term agreed upon, at a total cost of 7 per cent per year of the initial unpaid balance.

2. The dealer indorses this contract.

3. The manufacturer of the range executes a blanket repurchase agreement.

4. The bank pays the dealer the money.

5. The dealer pays the manufacturer for the range.

6. The monthly installments are paid by the purchaser direct to the bank.

7. On the full liquidation of the contract it is cancelled and the dealer and the manufacturer are free of any liability.

For the protection of all parties to this contract, however, the following system is established to take care of the contingencies of collection:

8. The dealers empowered to sell under this plan are selected by the manufacturer as responsible and competent and their character and credit approved by the bank.

9. In the case of every sales contract offered by the dealer the purchaser is investigated by the bank to determine if the customer is good for the amount of credit and whether in all probability he will meet his payments, independently of the dealer's indorsement or manufacturer's agreement.

10. In the event that the purchaser fails to make his payments the bank will carry the overdue account until it is 60 days delinquent.

11. At the end of 30 days delinquency the bank, while continuing its endeavor to collect, notifies the dealer of the delinquency and urges him to make an effort to influence the purchaser to bring the account up to date.

12. At the end of 60 days, demand will be made on the dealer for settlement in full and at the same time the manufacturer will be notified under the repurchase of account agreement so that the manufacturer may have 30 days in which to take action.

13. At the end of 90 days, if the account has not been brought up to date, or repurchased by the dealer, the manufacturer will remit to the bank for the unpaid balance of the account.

14. The manufacturer will repossess the appliance.

The operation of this plan provides many advantages in this practical hook-up of the various parties at interest in the transaction, among which are these:

15. The bank contributes the background of its ten years experience in the financing of installment paper for individuals by investigating purchaser credit, to insure safety and freedom from trouble for the dealer.

16. The bank checks the manufacturer's credit knowledge of the dealer and assists in protecting the manufacturer against embarrassment.

17. The bank employs its specialized collection system to secure payment of the installments, and keep the dealer out of trouble with his customers.

18. In case of delinquency the bank has facilities for dealing with the financial troubles of the individual and can help him carry out his contracts.

19. This procedure exhausts all possibilities for collection before falling back on the dealer's indorsement.

20. The purchaser and the dealer must both fail before any call is made upon the manufacturer.

21. Where repossessions become necessary, the manufacturer sends from his nearest dealer or branch office and secures the appliances.

22. The unpaid balance of the account may be salvaged by the resale of the appliance through another dealer as arranged by the manufacturer.

23. Any excess obtained by resale over the amount of the unpaid balance plus the costs of repossession will be returned to purchaser.

24. The power company will co-operate by supporting this system to the extent of financing its sales of refrigerators, ranges and water heaters in the Morris Plan Bank also. This will swell the volume of this business and make it possible to operate at this low cost. The bank believes that if sufficient volume develops it can eliminate the 1 per cent fee and handle this business for a flat discount of 6 per cent a year.

Repossession—a measure of credit policy

The counterbalance of such a plan would seem to be its best assurance of success. The Morris Plan Bank of Virginia has discounted some $67,000,000 of paper created by individuals to the extent of 220,000 items and acquired a vast information on the credit resources of the people of this territory. In the last four years it has been financing paper for one of the prominent manufacturers of a popular electrical appliance, following the general plan outlined above. In this case the bank has had to call upon the dealer to assume the contract only three or four times and has never had to fall back on the manufacturer.

But this matter of repossessions should be looked upon

as the barometer that indicates whether or not the system is in balance and operates efficiently. If there are too many repossessions it shows that the bank is being too lax in its credit requirements. But if there are too few repossessions it means that the bank is being too exacting in approving credit and is restricting the sale of appliances. The whole objective of the plan, of course, is to lubricate the process of selling and facilitate the development of market for the dealer and the manufacturer and the growth of load for the power company.

Mr. Boushall says that in his experience repossessions should not run in excess of one-half of 1 per cent in amount. This, after all, is a small matter against the volume of service rendered and business done. For it is in the interest of the public as well as the electrical industry and the bank that the householder should be assisted in the acquisition of this kind of modern equipment for comfort, labor saving and the protection of health. This means that the largest possible number of appliances should be sold and enjoyed, compatible with good business management and good domestic economy.

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Electrolytes for Hydrogen-Oxygen Cells

Sodium and potassium hydroxide solutions have been found best for electrolytic production of hydrogen and oxygen, according to a paper presented recently before the Electrochemical Society by Kirkpatrick, Sutherland and Wright. At 60 deg. the optimum concentrations are 21 per cent NaOH and 29 per cent KOH, at which their conductivities are about 0.8 and 1.12 ohm-centimeters, respectively. Some manufacturers recommend lower concentrations, such as about 15 per cent NaOH, to minimize corrosion, but with 27 per cent KOH and temperatures not exceeding 70 deg. C. the rate of corrosion is not excessive with current densities up to 30 amp. per square foot.

The measured efficiency of a cell filled with 24 per cent KOH solution and using nickel-plated anodes was 138 kw.-hr. per 1,000 cu.ft.

Presence of chlorides and sulphates in the electrolyte are to be particularly avoided, if cell life is not to be shortened, 0.1 per cent Cl and 0.2 per cent SO_4 being safe upper limits. Iron in the electrolyte is more troublesome because the ferric hydroxide formed tends to clog diaphragms and prevent proper flow of the electrolyte. Indirectly it sometimes leads to production of explosive gas mixtures. Excessive amounts of calcium or magnesium salts are to be avoided in feedwater, as they coat the anodes and increase power consumption. Distilled water or condensed steam is generally recommended.

The life of the electrolyte is also governed by spray losses and carbonation. With little or no scrubbing the spray loss from a single 10,000-amp. cell may be 5 to 25 lb. of alkali per year, or 2 to 10 per cent of the total in the cell. With open-type cells several per cent of the potash may be converted to the carbonate in a month, but this may be almost entirely prevented by covering the exposed electrolyte with mineral oil or wax. The specific conductance of a 25 per cent KOH solution saturated is only one-half that of one containing no carbonate at 60 deg. C.

Earth Explosion from Lightning

"The lower units of two insulator strings were covered with mud, also the full length of the pole and part of the crossarm." This was what A. Schultz, general line foreman of the Illinois Northern Utilities Company, saw when he visited the scene of a lightning stroke reported by a patrolman after a 132-kv. line had tripped out and the circuit breaker had been reclosed to restore service during a storm March 18 last. Mr. Schultz found that the lightning had blown a trench in the ground about 1½ ft. deep and equally wide and 7 ft. long, and in so doing had spattered muck most generously over the landscape.

The line is carried on H-frames with 50-ft. poles, 29-ft. crossarms and no longitudinal ground wire. The poles are set 7½ ft. in the ground, going down through 4 ft. of heavy loam to sand and gravel. Conductors are in flat configuration. Running down each pole, however, is a No. 6 iron wire attached with staples, extending about a foot above the pole top and spiraled around the butt. But the ground wires of the two H-frame poles are not interconnected either on the crossarm or in the ground. At the place where the lightning hit, a woven wire fence parallels the line about midway between the poles of the H-frames. The direction of the trench blown in the earth was toward the fence from the base of the hit pole. The pole itself showed little splintering; in fact, would not immediately be recognized as having been struck. But the ground wire down the pole had entirely disappeared, as had the staples with which it was fastened and also a pair of 3-in. aluminum pole number disks. The fence showed no signs of burning, but one of the 266-800-circ.mil A.C.S.R. conductors was badly burned, probably by the power arc that followed the lightning.

Lightning did this

At the far end of the lightning-blown trench is a protruding tree root. This was a part of a small tree stump that was lifted out of the ground.

As stated, the line has no horizontal ground wire protection. The individual ground wires on, and projecting above the tops of, the poles are, in effect, just lightning rods. The terrain of the line is flat prairie with few trees and at the place where the stroke occurred there is a gradual rolling rise of about 50 ft., with the pole that was struck at the high point if it can be said there is any particularly high point. No tests were made, but the ground resistance—gravel subsoil—all along the line is characteristically high. Probably the explosion was due to the fact that the underlying gravel was unable to dissipate the lightning energy, which was confined thus to the then very wet overlayer of loam in the immediate vicinity of the ground conductor passing through it.

Water Heating Installation Free

Profitable business developed by Hydro-Electric Power Commission of Ontario.
Details of installation and costs.

THE Hydro-Electric Power Commission of Ontario has introduced free electric water heating installations as an economical method for building load and using the excess power available. Any householder with a hot water tank can get a flat rate water heater installation free of charge. After much study and experimentation the commission has found it possible to make the installation at from $20 to $22 per heater. The annual income from each heater is an average of $25, the wholesale cost of power is about $25 per horsepower and the average installation is 750 watts, so that the cost of the installation is returned in about a year.

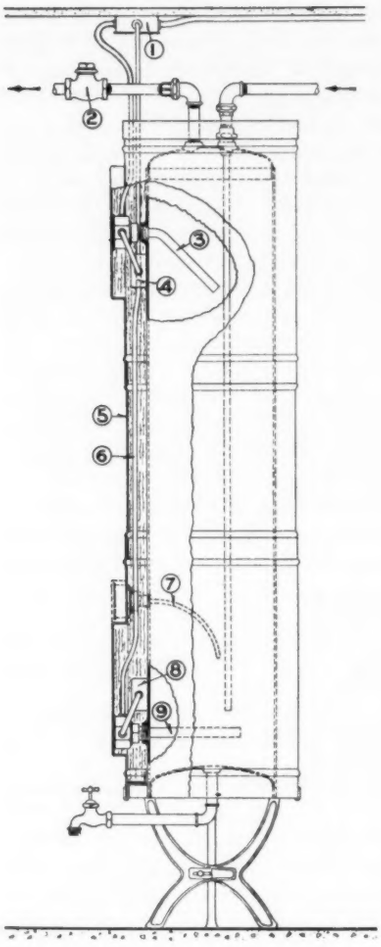
This plan is based upon adding new load where the customer supplies and maintains satisfactory hot water tanks. It is based upon a flat-rate, continuously operated heater that is equipped with insulation, thermostats and heating elements free of charge to the customers. Where it is advisable to add a booster heater to the installation, however, the customer pays a nominal charge and the energy used by the booster is metered. The cost of this booster installation is financed by the commission and monthly payments are collected during a five-year period.

When a customer applies for a heater installation a preliminary survey of his requirements and his premises is made. This first survey fixes the type of installation to use and the customer then signs a formal contract. The customer must supply a satisfactory tank and this must be properly located so that the cover, wiring and equipment can be installed conveniently.

After this contract is signed the job of wiring and installation is awarded to a local contractor, who does this work at a prearranged standard price. This contractor removes existing connections for other types of heating, prepares the tank for the flat-rate heater installation, installs the heater, installs a check valve in the hot water line if necessary, tests the installation for leaks, installs the thermostat and a standard switchbox that are supplied him by the commission, makes the necessary wiring connections and installs the cover with its insulation.

Rates vary with communities

The contractor supplies labor, the wiring from the main service switch to a special switch box, the wiring and the connections from the distribution center to the special switch box, the BX cable from the special box to a junction box at the tank and other incidental bushings, screws, and locknuts.



Immersion type of water heater installation

(1) Junction box; (2) check valve; (3) booster heater of tubular or hairpin type, usually 1,500 watts; (4) thermostat for booster heater, usually adjusted for on at 125 deg. and off at 135 deg.; (5) sheet-metal cover filled with rock wool; (6) special lead-sheathed cable; (7) flat rate heater bent hairpin type, alternative to No. 9; (8) thermostat for flat-rate heater; (9) flat-rate heater, tubular or hairpin type.

Each town in the province has a different rate and these vary from about 30 to 75 cents per 100 watts of heating element. The average flat-rate heater has a 750-watt element installed. In addition to the flat rate a charge of 10 cents a month is made for maintenance and each local municipality does the maintenance work and collects the money.

If a booster heater is installed the cost to the customer is about $8 and this cost is collected in 25-cent monthly charges over a period of five years, which returns the original expenditure and pays interest at 5 per cent. Heaters above 1,500 watts in capacity are special and charges are adjusted accordingly.

Standardized installations used

After investigation the commission standardized on a metal cover for the tanks and on rock wool as insulation material. It also standardized on thermostats and on the strap-on and immersion types of heating elements. The strap-on is used where water conditions are such that low temperature heating is required and the immersion elements are standard where water conditions permit of this higher temperature heating.

A special double switch box was also standardized for the flat-rate and booster heating element connections. BX cable is standard for use from a 4-in. junction box at the tank to this special box. Investigation of thermostats led to the eventual use of a bellows type for large installations and of a bimetallic strip type for the ordinary household tanks. This bimetallic thermostat has the strip in the form of a spring that expands and opens the circuit at a temperature of about 180 to 190 deg. and the current is carried directly to the fixed and the movable spring contact points. The immersion heaters favored are the hairpin type. The strap-on heater developed consists of a flexible steel outer band to fit several tank sizes,

a layer of asbestos, the heating element and an inner band of aluminum that fits against the tank. This heater is highly efficient as compared to other types of strap-on heaters tested.

From the standard junction box above the tank a lead-covered cable with two No. 12 slow-burning insulated wires is connected to the head of the flat-rate heater. At the heater head two asbestos-insulated wires attached to the thermostat are connected.

The metal container or tank cover is made of a band that clamps around the tank and a ring which rests upon supporting lugs, three side-wall metal sections and a two-part cover. The rock wool installation is tamped into the space between the tank and the metal cover. About 35 lb. of rock wool is sufficient for 2 in. of insulation on a 30-gal. tank. Each section of side wall is placed in position after the preceding section has been filled with rock wool.

Details of costs and method of sales

Inspection is made of each installation before service is given and this charge is $1.25 per heater. After bids were received a flat price to the contractor was made of $6.50 per heater, with $1.50 additional if a booster is installed at the same time; if added later, the charge is $2.50. The standard special switch box costs $1 or $1.25, depending upon the use of the single or double switch. The cost of the household heater thermostat is $2.

Advertising is used to introduce the new plan and each local municipality co-operates. More than 1,500 heaters have been installed and the goal is about 50,000. The local Toronto municipality modified the plan to offer a tank free of charge and in the first week of the offer 5,000 applications were received. The reception to the plan has been encouraging and the contractors and manufacturers have co-operated in developing the equipment and plans. The commission is confident that the electric water heating business can be developed quickly and economically by the methods outlined.

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Visual Acuity Under Sodium Light

By M. LUCKIESH

Director Lighting Research Laboratory
General Electric Company, Cleveland, Ohio

Visual acuity is generally defined as the ability to distinguish fine detail. This is an essential of good lighting and good vision. But in everyday seeing it has been overemphasized, perhaps because it is one of the more readily distinguishable and measurable factors in seeing. If one must see certain details in order to recognize objects so as to perform any visual task, such as reading a newspaper or a traffic sign, visual acuity is an important factor. However, contrast and other factors also play very important parts. Furthermore, in everyday seeing visual acuity, which is a threshold or limiting condition, decreases in importance. In other words, a given set of conditions may be adequate for the requirements of visual acuity, but may be quite inadequate for many other factors which influence the behavior and welfare of the human seeing-machine.

It has long been known that visual acuity under monochromatic light of certain wave lengths is superior to light of extended or heterogeneous spectral character. Furthermore, this advantage is generally greater at low brightness levels than at higher ones. Mercury-arc light has been considered more or less monochromatic in character and, therefore, claims have been made that it is superior in "revealing power." Extensive measurements of threshold discrimination of black lines on a white background showed no practical difference between mercury-arc light and tungsten-filament light over a range of brightneses equavilent to that of a white background illuminated over a range from 5 to 125 foot-candles.* The experiment was limited to this range because it was the practical lighting range at that time for the work-world. The explanation of these results probably lies in the fact that the visible mercury spectrum, even though confined to isolated wave lengths in the violet, blue, green and yellow regions, appears to be fairly monochromatic, but is far from it. The violet and blue light is of wave lengths which the normal eye cannot focus very well at normal distances at which visual tasks are performed. Being more intense than the short-wave visible radiation in the continuous spectra of tungsten-filament light, they counteract, through chromatic aberration of the simple lens system of the eye, the tendency toward monochromatism of mercury light due to concentration of much light in the middle part of the visible spectrum.

Knowing that the blue and violet light is undesirable from the viewpoint of chromatic aberration in the eye, visual acuity was determined under tungsten-filament light whose spectrum was shortened by filtering out the short-wave visible light.† Visual acuity was greater for the latter than for the original light for the same level of brightness or illumination. However, the loss of light by this method and the importance of other factors of seeing militated against adopting this expedient for producing an illuminant for any general use.

The sodium lamp is in the experimental stage. Its light is practically monochromatic. A very slight amount of continuous-spectrum light is present, but practically all the light is confined to the well-known yellow double line. It, then, is quite practically monochromatic and quite satisfactory as to wave length of visible radiation. Being monochromatic, color contrasts generally cease to exist under it and all the advantage of color contrast—which is generally considerable—disappears, to be replaced more or less by brightness contrast. A decision in regard to the influence upon contrast must await a more elaborate research which is under way. However, the extreme distortion of color values seems to relegate sodium light to low-intensity lighting fields, such as highways and railroad yards.

Visual acuity was studied over a brightness range corresponding to the brightnesses of a white surface under intensities of 0.02 to 20 foot-candles. As was to be expected from earlier experiments, visual acuity is considerably greater throughout the entire range for sodium light compared with that for ordinary tungsten-filament light. However, this is not the entire story. Many contrasts will be decreased under sodium light and many will be increased. Furthermore, the importance

**Journal Franklin Institute, 205, 1928, 565.*
†Journal Optometric Society of America, 10, 1925, 27.

of visual acuity in low-intensity lighting must be properly appraised. Therefore, interesting as sodium light is for special cases, its general use seems to be in low-intensity fields, where color appearance is not important, but further predictions must await further scientific study of other important factors of seeing, particularly contrast.

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READERS' FORUM

"Conductor Vibration Editorial"

To the Editor of the ELECTRICAL WORLD:

I noticed in the ELECTRICAL WORLD of June 17, 1933, page 787, an editorial under the heading "Suggestions for Conductor Vibration." Many of the statements in this editorial are misleading and, what is more important from our standpoint, the tenor of the editorial is such as to give an uninformed reader the impression that the Aluminum Company of America has attacked the conductor vibration problem by superficial methods only, and that we have failed to develop a satisfactory solution.

The editorial begins with mention of hazard to overhead conductors, particularly aluminum cable steel reinforced from high- and low-frequency vibration. Presumably high-frequency vibration refers to what is generally termed resonant vibration, caused by steady winds of low velocity, and by low-frequency vibration is meant dancing, or galloping, which is generally associated with high winds and sleet. Resonant vibration occurs in all conductors, regardless of material, but is more severe on tightly strung cables whose ratio of diameter to weight is relatively large. Nevertheless, there are numerous instances of failure of steel, copper, bronze and other conductors, as well as aluminum cable steel reinforced.

Experience indicates that the occurrence of low-frequency vibration is independent of the conductor material, but the damage to ties, insulators and crossarms is frequently greater on heavier conductors on account of greater impact.

In the editorial it is stated that "the use of armor rods is expensive and is debatable as to effect." The increased cost from the use of armor rods is not of serious importance. Armor rods do give adequate protection from vibration, as is evidenced by laboratory tests and by field experience extending over a period of seven years or more. The use of these rods has been very extensive as is indicated by the installation of more than 500,000 sets since 1930. Armor rods also afford very desirable protection from flashover burns, and some customers have installed them for this reason alone.

No mention in this editorial was made of the development of Stockbridge dampers. These are relatively inexpensive and are unquestionably effective in damping vibration. Their efficiency has been proved by more than seven years successful experience on several thousand miles of major transmission lines as well as by extensive tests in our own research work.

The statement that "the fatigue of metals is essentially a corrosion effect caused by internal oxidation" is not in agreement with the best authorities on the subject of fatigue. Reference is made to the report of the research committee on fatigue of metals from the *Proceedings* of the American Society for Testing Materials, Vol. 30, Part I, 1930. In this report the chairman of the committee, H. F. Moore, professor of engineering materials, University of Illinois, defines fatigue of metals as "the phenomenon of the progressive fracture of a metal by means of a crack which spreads under repeated cycles of stress." In this same report H. S. Rawdon, senior metallurgist, U. S. Bureau of Standards, states that "the response of a metal to 'fatigue' stresses—that is, repeated cycles of stress—is essentially the same in nature as it is to a static stress. Slipping on certain crystal planes occurs within the body of individual grains of the metal specimen and the path of the fracture, if fracture does ultimately occur, is trans-crystalline in its course." The *Transactions* of the American Society of Mechanical Engineers, Applied Mechanics Section, March, 1933, page 15, carries an article by H. F. Moore entitled "The Fatigue of Metals—Its Nature and Significance," in which no mention is made of the internal oxidation theory.

In short, it is our belief that the phenomenon of fatigue of metals under repeated stresses may and frequently does take place quite irrespective of any corrosion influences or any action which might be even remotely associated with corrosion. Certainly internal oxidation has no place whatsoever in the phenomenon of fatigue of metals as usually defined and considered.

The suggestion in the editorial that a high-strength steel core covered by a non-oxidizing metal coating such as can be produced by galvanizing be used is quite logical and has been standard practice ever since the introduction of aluminum cable steel reinforced. It may be of interest to note that the fatigue failure of the steel core rarely, if ever, occurs.

The suggestion in the editorial that it might be advantageous to anneal very thoroughly the aluminum strand appears impracticable from every angle, and in addition would not afford relief from fatigue failure. The suggestion that the aluminum strands be covered with a non-corrosive metallic layer is not pertinent, since the aluminum itself is extremely resistant to corrosion because by nature it is protected by a highly corrosion-resistant oxide film.

Contrary to the opinion expressed in the editorial the Aluminum Company's efforts to solve the vibration problem have not been confined to cut-and-try methods. A thoroughly organized intensive program has been conducted along three major lines of investigation:

1. Fundamental theoretical studies of all phases of the vibration phenomenon,

2. Laboratory tests of materials, conductors and accessories,

3. Field experiments carefully co-ordinated with laboratory tests and theoretical studies.

A progress report of this investigational work was presented at the summer convention of the A.I.E.E. in the paper entitled "Vibration of Overhead Transmission Lines," by R. A. Monroe and R. L. Templin, June, 1932.

Reference may also be made to the report of Group II of the steel transmission towers and conductors subcommittee of the A.I.E.E. as published in Electrical Engineering, April, 1933, page 243. The following paragraph

presents the opinion of this committee on the conductor vibration problem:

D—Prevention of Vibration and Damping in Conductors—There have now been developed vibration dampers and reinforcing devices that experience thus far indicates will provide practical protection against damage from vibration occurring at moderate wind velocities characterized by rather high frequencies. Hence freedom from injurious vibration should be secured.

R. A. MONROE.

Aluminum Company of America.

[The interesting comment of Mr. Monroe raises several questions. The fundamental theory of the fatigue of metals apparently is controversial, for very notable metallurgical and chemical authorities support our view that fatigue is an oxidation phenomenon. The problem of conductor vibration applies to all conductor materials, of course, and field information leads us to think that this is a very serious problem on existing high-tension lines. With such a difference of opinion as to the fundamental phenomena of fatigue, we believe that it is proper to still call remedies applied to existing lines "cut-and-try" and further believe that it is highly important to speed up fundamental research to overcome fatigue effects on all kinds of conductors that are to be installed on new lines—EDITORS.]

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Utility Merchandising in New York

To the Editor of the ELECTRICAL WORLD:

I note your recent editorial, "When the Power Company Quits Merchandising," wherein you point out that other agencies must pick up the work where the utility leaves off, and that it takes time to set up machinery to do the job.

In view of the announcement that utilities serving Manhattan, Brooklyn, the Bronx and Queens will discontinue selling electrical appliances on July 1, it may interest you to know what has been done in this territory along the lines you discussed. This was no sudden move. For more than a year our companies had been working toward it. They ceased aggressive sales campaigns of appliances featured by brand and price, substituting promotional efforts, co-ordinated with those of other dealers through the Electrical Association of New York. They advertised appliances promotionally, mentioning that these could be bought from other dealers. They set up experimental forms of co-operation with department stores and electrical dealers which appear to be working satisfactorily, and can and will be further developed. A system of turning over prospective customers and sales leads to other dealers is being worked out. Sales people and home economics specialists are working with the sales forces of department stores in the stores, training them in the phases of salesmanship with which our people are acquainted and they are not so familiar, and demonstrating appliances to customers. This is particularly important in our territory, where department stores are so numerous and their customer traffic so large.

After July 1 all these forms of co-operation will be continued and carried further. Our companies have by no means lost interest in the sale of appliances in this territory. We believe we still have a responsibility in the situation and that other dealers will, at least for a time, look to us for a certain amount of leadership. Our position is that these other merchants are sufficiently numerous, sufficiently interested in this business and well enough equipped to handle it so that, with such co-operation as the utilities and the manufacturers can give, sales should not fall off and load development should continue. Our selfish interest in load building assures our vigorous efforts—short of actual selling of appliances. We believe, in our territory at least, department stores and other stores can do that, and quite likely do more of it than we ever could.

FRANK W. SMITH,

New York Edison Company. President.

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BOOK REVIEWS

Communication Agencies and Social Life

By M. M. Willey and S. A. Rice. Published by McGraw-Hill Book Company, Inc., 330 West 42d Street, New York. 229 pages. Price, $2.50.

This one of the monographs of the Recent Social Trends series being published for the President's committee correlates the statistical facts with the sociological consequences of our media of communication. The effects of railroads, postal service, publications, automobile, air travel, telephone, sound pictures, broadcasting upon one another and upon our behaviorism are surveyed to disclose the trends. Does the annihilation of distance and time tend to make us a standardized race? What does stimulation of new tastes and desires do to the objective standard of living? Careful culling of statistics has confined the presentation to the dominant factors. There is more of diagnosis than of prognostication. Our social health is charted in terms of response to inventive and exploitive stimuli out of the national mesh of nerves which our multifarious communication agencies constitute.

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What Electricity Costs

Edited by Morris L. Cooke. Published by New Republic, Inc., New York. 275 pages, including tabular appendix. Price, $1.

In measuring up to the claim that this book is the first comprehensive presentation of electrical distribution costs it will undoubtedly suffer the hazards of all pioneers. But it is nevertheless deserving of credit for breaking the wall of silence on this subject. It will assuredly be followed by other attempts and sooner or later the myriad of factors which conspire to cause a wide spread in distribution costs will find their true place in a semi-universal formula.

Consulting engineers, municipal electrical administrators and regulatory commissions participated in the programs of the Institute of Public Engineering held under the ægis of the Power Authority of New York in New York City on January 20, 1933. The papers at the meeting and the discussion of them have been correlated by Mr. Cooke, a trustee of the Power Authority, in this book. Few engineers or cost analysts of privately owned utilities participated in that meeting, and consequently the costs presented are largely of a statistical nature gleaned from official reports of utilities to state commissions.

The methods employed in estimating the average costs and deriving formulas for representative combinations of the variables are therefore likely to undergo revision as rapidly as a broader discussion ensues. The book constitutes the point of departure of clarifying progress.

Men of the Industry

ARTHUR HUNTINGTON, public relations engineer of the Iowa Railway & Light Corporation, has been elected president of the American Society of Agricultural Engineers.

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BASIL MANLY, liberal and writer, has been made a member of the Federal Power Commission. Mr. Manly for several years headed the People's Lobby in Washington.

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WILLIAM H. MEESE, vice-president of the Western Electric Company and manager of the company's Point Breeze Works, has been honored by Washington College, which conferred the honorary degree of doctor of laws upon him.

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LEE A. CLARK has been appointed sales promotion manager of the Frigidaire Corporation. Mr. Clark has been general sales manager of the Fort Wayne Engineering & Manufacturing Company and sales promotion manager of the Wayne Company.

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LEWIS B. HERRINGTON, formerly president Kentucky Utilities Company (ELECTRICAL WORLD, May 6, 1933) has opened offices in Louisville, from which he plans to operate in the buying, selling, trading, operating, reconditioning, etc., of public utility plants, chiefly electrical.

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L. C. WILLIAMS, for eight years district manager of the Los Angeles, Cal., office of the Pacific Electric Manufacturing Company until illness in the early part of 1932 forced him to terminate this connection, has become a partner in the Coast Engineering & Equipment Company, Los Angeles. Fully recovered, Mr. Williams will participate actively in the work of this organization, which acts as manufacturers' representative in the industrial, heavy construction and building specialties field.

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OBITUARY

EUGENE S. SIMONS, president of the Pittsburgh Reflector Company, died June 21.

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J. NAP TREMBLAY, contractor and builder of Canadian transmission lines, died June 24 in Montreal. Mr. Tremblay was prominent in local power and telephone circles and active in local electrical association work.

ERNEST J. BECHTEL, retired engineer and operator of public utility properties, died suddenly, June 25 at his home in Willsboro, N. Y. Mr. Bechtel had been associated at various times with the Des Moines City Railway, Citizens' Street Railway, and was for thirteen years electrical engineer and manager of the power and light department of the Toledo Railways & Light Company and its predecessors. From 1907 to his retirement in 1931 he was associated with Hodenpyl, Walbridge & Company and Hodenpyl, Hardy & Company, holding vice-presidencies in various traction, power and light companies in which that organization was interested. Mr. Bechtel was a fellow of the American Institute of Electrical Engineers and a member of other engineering societies. He was 63 years old.

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CHARLES A. CLOUGH, for 30 years connected with the supply department of the General Electric Company at Schenectady, died at Vineyard Haven, Mass., recently at the age of 74. Educated at Worcester Polytechnic Institute, Mr. Clough spent much of his time in interplant supplies co-ordination work. He retired from the company about five years ago.

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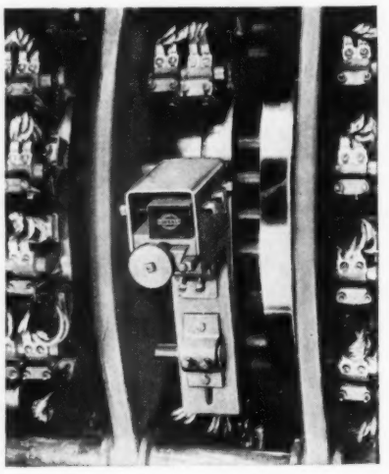
New Equipment Available

Ring Grinder Supplants Slow-Speed Lathe Tool

An ideal ring grinder which supplants the slow-speed lathe tool cutting method, which took machines completely out of service until the job was completed, has



been announced by the Ideal Commutator Dresser Company, Sycamore, Ill. Previous rings have usually been cut with a lathe tool at slow speed. When machines were speeded up the shaft rose off of the bottom of the bearings, changing its center and then the rings were eccentric. Rotaries need not be dismantled and can be put back to 50 per cent service in just a few minutes, it is claimed.

It is no longer necessary to use an extra motor and pulley or a low-voltage booster generator to drive the rotary to be trued, the manufacturer claims. Also, it is no longer necessary to take another machine out of service and use it to drive the machine to be trued. The Ideal ring grinder produces an accurately grounded ring, which will be true at operating speed because it is ground at normal operating speed.

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Watt-Hour Demand Meters

A meter which combines in one device a watt-hour meter and a recording demand meter has been announced by the General Electric Company. The demand mechanism of the meter, which has been designated as type DG-1, is of the block-interval type, recording on a strip-chart the demand over a definite time interval. A record or line is made on the chart for each interval, with $\frac{1}{8}$ in. between these lines for all ratings.

A hook or quirk at the end of the ink line definitely indicates the exact value of the demand, it is claimed. In addition, the chart is advanced continuously so that the slope of the line on the chart gives indication of the variation in magnitude of the load during the time interval.

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OIL CIRCUIT BREAKERS utilizing for the first time condenser bushings on small breakers are announced by the Westinghouse Electric & Manufacturing Company. These breakers are manually or electrically operated and are rated for indoor service of 5,000, 7,500 and 15,000 volts.

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SAID TO BE THE SMALLEST 30-amp., two-pole, solid neutral switch on the market, Colt-Noark switch No. 513 has been announced by the Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn. It is of dual-break construction, front operated, and despite its size provides sufficient space for wiring without removing the block and has means for locking in the "off" position if desired, it is claimed.